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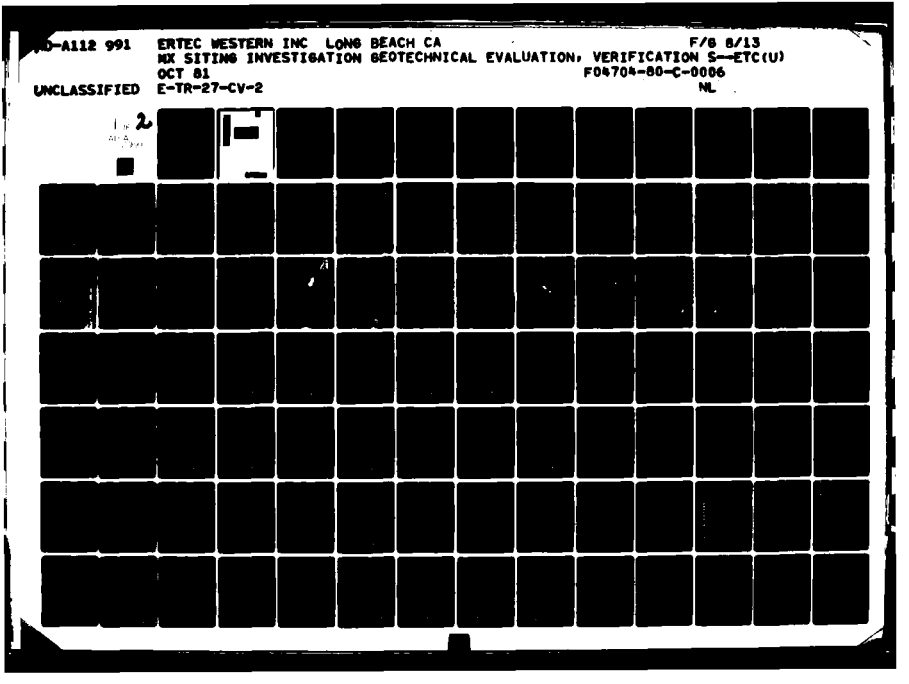


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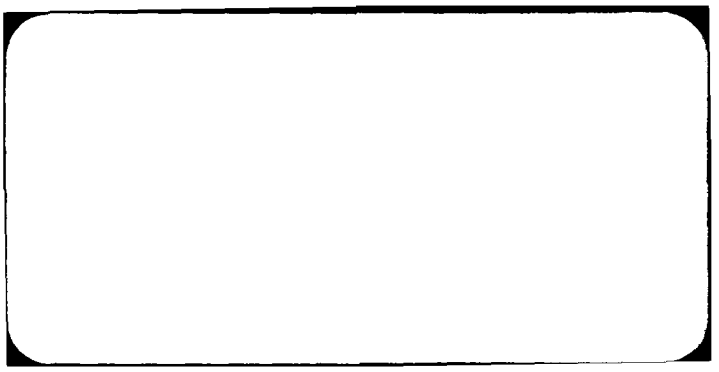

E-TR-27-CV-II

MX SITING INVESTIGATION
GEOTECHNICAL EVALUATION

VERIFICATION STUDY - CAVE VALLEY
NEVADA

VOLUME II - GEOTECHNICAL DATA

Prepared for:

U.S. Department of the Air Force
Ballistic Missile Office (BMO)
Norton Air Force Base, California 92409

Prepared by:

Ertec Western, Inc.
3777 Long Beach Boulevard
Long Beach, California 90807

26 October 1981

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Geology, Groundwater, Seismic, Boring logs, Cone Penetrometer ~~test results~~

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report contains the field data & lab test results from the verification investigation of Cave Valley

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FOREWORD

This volume of geotechnical data was compiled for the Department of the Air Force, Ballistic Missile Office (BMO), in compliance with Contract No. F04704-80-C-0006, CDRL Item 004A6. It contains the field data and laboratory test results from the Verification investigation of Cave Valley. A synthesis of these data are available in Volume I (E-TR-27-CV-I).

The data in each section of this volume are preceded by an explanation of the format and terms used in the compilation.

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1.0 ACTIVITY MAP AND GEOGRAPHIC COORDINATES

Explanation: Locations of all field activities are shown in Drawing II-1-1, Activity Location Map (in pocket). The geodetic and Universal Transverse Mercator (UTM) coordinates of all activities are listed in Table II-1-1.

CAVE VALLEY ACTIVITY LOCATIONS

ACT ID.	GEODETIC COORD. LAT. DEG	LAT. MIN	LONG. DEG	LONG. MIN	UTM COORD. ZONE 12 N(KM)	E(KM)
BORING SITES						
CV- B01	38	19.36	114	53.67	4243.51	684.06
CV- B02	38	28.17	114	52.40	4259.84	685.54
CV- B03	38	38.39	114	50.12	4278.82	688.41
CV- B04	38	35.34	114	47.31	4273.29	692.61
CPT SITES						
CV- C01	38	21.09	114	50.25	4246.83	688.96
CV- C02	38	20.60	114	51.27	4245.89	687.50
CV- C03	38	20.13	114	52.38	4244.97	685.91
CV- C04	38	19.36	114	53.67	4243.51	684.06
CV- C05	38	18.55	114	55.45	4241.95	681.50
CV- C06	38	24.95	114	48.72	4254.01	691.02
CV- C07	38	24.29	114	50.03	4252.74	689.15
CV- C08	38	25.23	114	51.71	4254.43	686.67
CV- C09	38	25.80	114	53.82	4255.41	683.57
CV- C10	38	26.95	114	54.92	4257.50	681.92
CV- C11	38	28.17	114	52.40	4259.84	685.54
CV- C12	38	27.26	114	50.89	4258.22	687.76
CV- C13	38	26.47	114	49.60	4256.80	689.68
CV- C14	38	26.64	114	48.28	4257.16	691.59
CV- C15	38	27.62	114	46.44	4259.04	694.23
CV- C16	38	31.84	114	47.22	4266.80	692.90
CV- C17	38	31.25	114	45.71	4265.77	695.12
CV- C18	38	35.34	114	47.31	4273.29	692.61
CV- C19	38	38.39	114	50.12	4278.82	688.41
CV- C20	38	38.55	114	49.60	4279.14	689.16
GEOLOGIC STATIONS						
CV-GS01	38	17.47	114	53.00	4240.03	685.11
CV-GS02	38	47.55	114	49.32	4295.79	689.16
CV-GS03	38	41.09	114	49.64	4283.83	688.98
CV-GS04	38	40.36	114	46.40	4282.60	693.71
CV-GS05	38	39.97	114	48.04	4281.81	691.35
CV-GS06	38	38.21	114	50.63	4278.47	687.67
CV-GS07	38	29.59	114	47.14	4262.65	693.12

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GEODETIC AND UTM COORDINATES
OF ACTIVITY LOCATIONS
CAVE VALLEY, NEVADA

26 OCT 81

TABLE II-1-1

CAVE VALLEY ACTIVITY LOCATIONS

ACT ID.	GEODETIC COORD. LAT. DEG	LAT. MIN	LONG. DEG	LONG. MIN	UTM COORD. ZONE 12 N(KM)	E(KM)
CV-GS08	38	31.87	114	47.00	4266.87	693.23
CV-GS09	38	35.68	114	46.22	4273.96	694.19
CV-GS10	38	36.90	114	47.26	4276.16	692.62
CV-GS11	38	35.30	114	47.58	4273.20	692.23
CV-GS12	38	31.13	114	49.99	4265.41	688.92
CV-GS13	38	23.89	114	48.99	4252.05	690.68
CV-GS14	38	25.85	114	48.41	4255.69	691.44
CV-GS15	38	26.20	114	49.25	4256.31	690.20
CV-GS16	38	27.35	114	51.02	4258.37	687.57
CV-GS17	38	28.25	114	53.60	4259.96	683.78
CV-GS18	38	25.24	114	54.04	4254.37	683.28
CV-GS19	38	22.42	114	54.90	4249.12	682.14
CV-GS20	38	23.20	114	49.15	4250.77	690.48
CV-GS21	38	17.61	114	54.53	4240.24	682.88
CV-GS22	38	18.56	114	55.38	4241.98	681.60
CV-GS23	38	19.44	114	56.59	4243.56	679.80
CV-GS24	38	21.32	114	54.67	4247.09	682.52
CV-GS25	38	21.92	114	54.88	4248.21	682.18
CV-GS26	38	18.98	114	53.50	4242.82	684.32
CV-GS27	38	19.22	114	51.45	4243.32	687.30
CV-GS28	38	20.58	114	50.78	4245.85	688.22
CV-GS29	38	19.97	114	54.59	4244.61	682.69
CV-GS30	38	18.00	114	54.14	4240.97	683.43
CV-GS31	38	42.18	114	50.67	4285.82	687.44
CV-GS32	38	37.14	114	46.54	4276.63	693.66
CV-GS33	38	39.26	114	46.11	4280.57	694.18
CV-GS34	38	38.60	114	49.43	4279.23	689.40
CV-GS35	38	37.53	114	48.58	4277.28	690.67
CV-GS36	38	36.28	114	48.71	4274.98	690.54
CV-GS37	38	33.48	114	48.80	4269.79	690.54
CV-GS38	38	35.26	114	45.32	4273.21	695.51
CV-GS39	38	22.55	114	49.31	4249.56	690.27
CV-GS40	38	24.82	114	49.14	4253.76	690.42
CV-GS41	38	24.99	114	48.36	4254.10	691.55
CV-GS42	38	26.75	114	48.50	4257.35	691.27
CV-GS43	38	27.06	114	47.13	4257.98	693.25
CV-GS44	38	27.23	114	46.29	4258.31	694.46
CV-GS45	38	34.26	114	47.35	4271.29	692.61
CV-GS46	38	31.07	114	45.22	4265.46	695.84

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GEODETIC AND UTM COORDINATES
OF ACTIVITY LOCATIONS
CAVE VALLEY, NEVADA
PAGE 2 OF 4

26 OCT 81

TABLE II-1-1

CAVE VALLEY ACTIVITY LOCATIONS

ACT ID.	GEODETIC COORD. LAT. DEG	LAT. MIN	LONG. DEG	LONG. MIN	UTM COORD. ZONE 12 N(KM)	E(KM)
CV-GS47	38	30.43	114	47.12	4264.20	693.11
CV-GS48	38	27.99	114	47.94	4259.67	692.03
CV-GS49	38	29.14	114	51.14	4261.68	687.32
CV-GS50	38	32.23	114	48.77	4267.47	690.63
CV-GS51	38	24.96	114	51.43	4253.94	687.08
CV-GS52	38	25.84	114	53.00	4255.51	684.76
CV-GS53	38	27.07	114	54.04	4257.76	683.20
CV-GS54	38	22.78	114	53.61	4249.83	684.00
CV-GS55	38	18.75	114	55.88	4242.32	680.87
CV-GS56	38	20.32	114	55.22	4245.23	681.76
REFRACTION LINES						
CV- S01	38	21.09	114	50.25	4246.83	688.96
CV- S02	38	35.30	114	45.83	4273.26	694.76
CV- S03	38	31.25	114	45.71	4265.77	695.12
CV- S04	38	27.62	114	46.44	4259.04	694.23
CV- S05	38	26.95	114	54.92	4257.50	681.92
CV- S06	38	28.17	114	52.40	4259.84	685.54
CV- S07	38	24.95	114	48.72	4254.01	691.02
CV- S08	38	18.55	114	55.45	4241.95	681.50
CV- S09	38	38.13	114	47.94	4278.41	691.58
CV- S10	38	28.27	114	54.06	4259.97	683.11
RESISTIVITY LINES						
CV- R01	38	21.09	114	50.25	4246.83	688.96
CV- R02	38	35.30	114	45.83	4273.26	694.76
CV- R03	38	31.25	114	45.71	4265.77	695.12
CV- R04	38	27.62	114	46.44	4259.04	694.23
CV- R05	38	26.95	114	54.92	4257.50	681.92
CV- R06	38	28.17	114	52.40	4259.84	685.54
CV- R07	38	24.95	114	48.72	4254.01	691.02
CV- R08	38	18.55	114	55.45	4241.95	681.50
CV- R09	38	38.13	114	47.95	4278.41	691.57
CV- R10	38	28.27	114	54.06	4259.97	683.11

CAVE VALLEY ACTIVITY LOCATIONS

ACT ID.	GEODETIC COORD. LAT. DEG	MIN	LONG. DEG	MIN	UTM COORD. ZONE 12 N(KM)	E(KM)
SURFICAL SOIL SAMPLES						
CV-CS03	38	20.13	114	52.38	4244.97	685.91
CV-CS07	38	24.29	114	50.03	4252.74	689.15
CV-CS12	38	27.26	114	50.89	4258.22	687.76
CV-CS14	38	26.64	114	48.28	4257.16	691.59
CV-CS20	38	38.55	114	49.60	4279.14	689.16
TEST PITS						
CV- P01	38	35.30	114	45.83	4273.26	694.76
CV- P02	38	31.84	114	47.22	4266.80	692.90
CV- P03	38	31.25	114	45.71	4265.77	695.12
CV- P04	38	26.95	114	54.92	4257.50	681.92
CV- P05	38	25.23	114	51.71	4254.43	686.67
CV- P06	38	27.62	114	46.44	4259.04	694.23
CV- P07	38	21.09	114	50.25	4246.83	688.96
CV- P08	38	20.60	114	51.27	4245.89	687.50
CV- P09	38	18.55	114	55.45	4241.95	681.50
TRENCH SITES						
CV- T01	38	35.34	114	47.31	4273.29	692.61
CV- T02	38	38.39	114	50.12	4278.82	688.41
CV- T03	38	26.47	114	49.60	4256.80	689.68
CV- T04	38	28.17	114	52.40	4259.84	685.54
CV- T05	38	25.80	114	53.82	4255.41	683.57
CV- T06	38	24.95	114	48.72	4254.01	691.02
CV- T07	38	19.36	114	53.67	4243.51	684.06
WATER WELL SITES						
CV- 001	38	38.55	114	49.60	4279.14	689.16
CV- 002	38	37.63	114	48.57	4277.47	690.69

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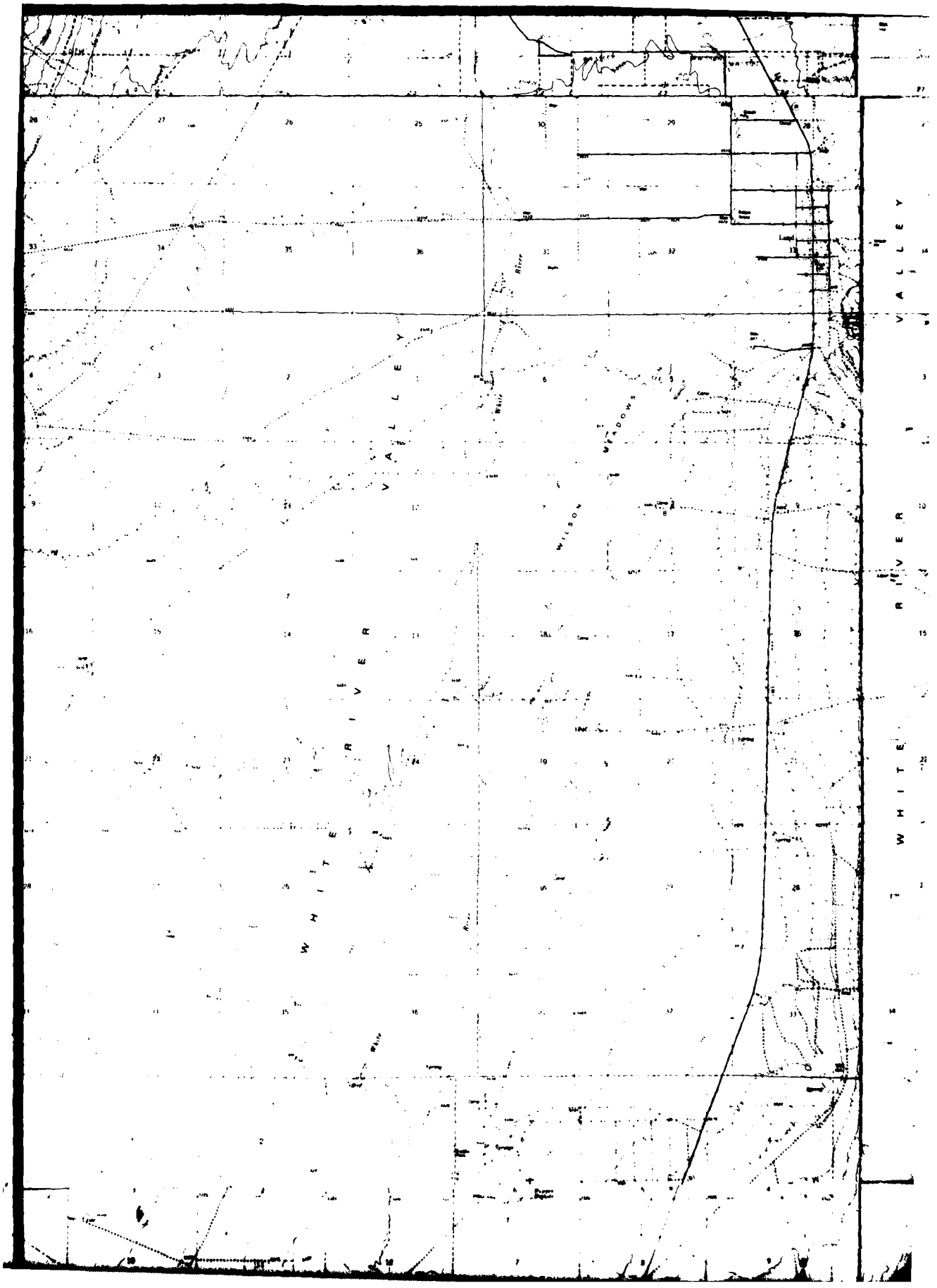
GEODETIC AND UTM COORDINATES
OF ACTIVITY LOCATIONS
CAVE VALLEY, NEVADA

26 OCT 81

TABLE II-1-1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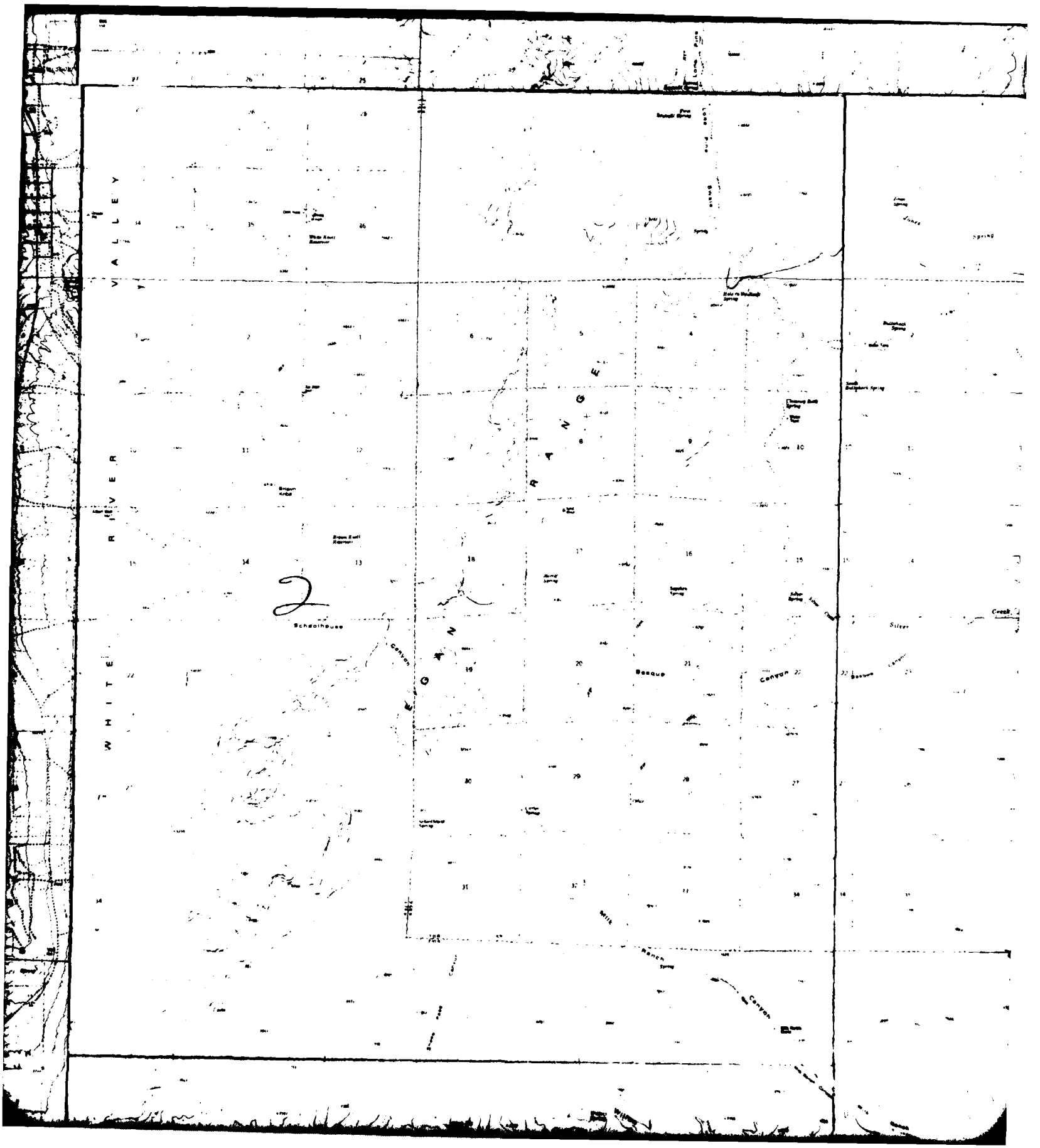
WILSON MEADOWS
WHITE RIVER VALLEY
WHITE RIVER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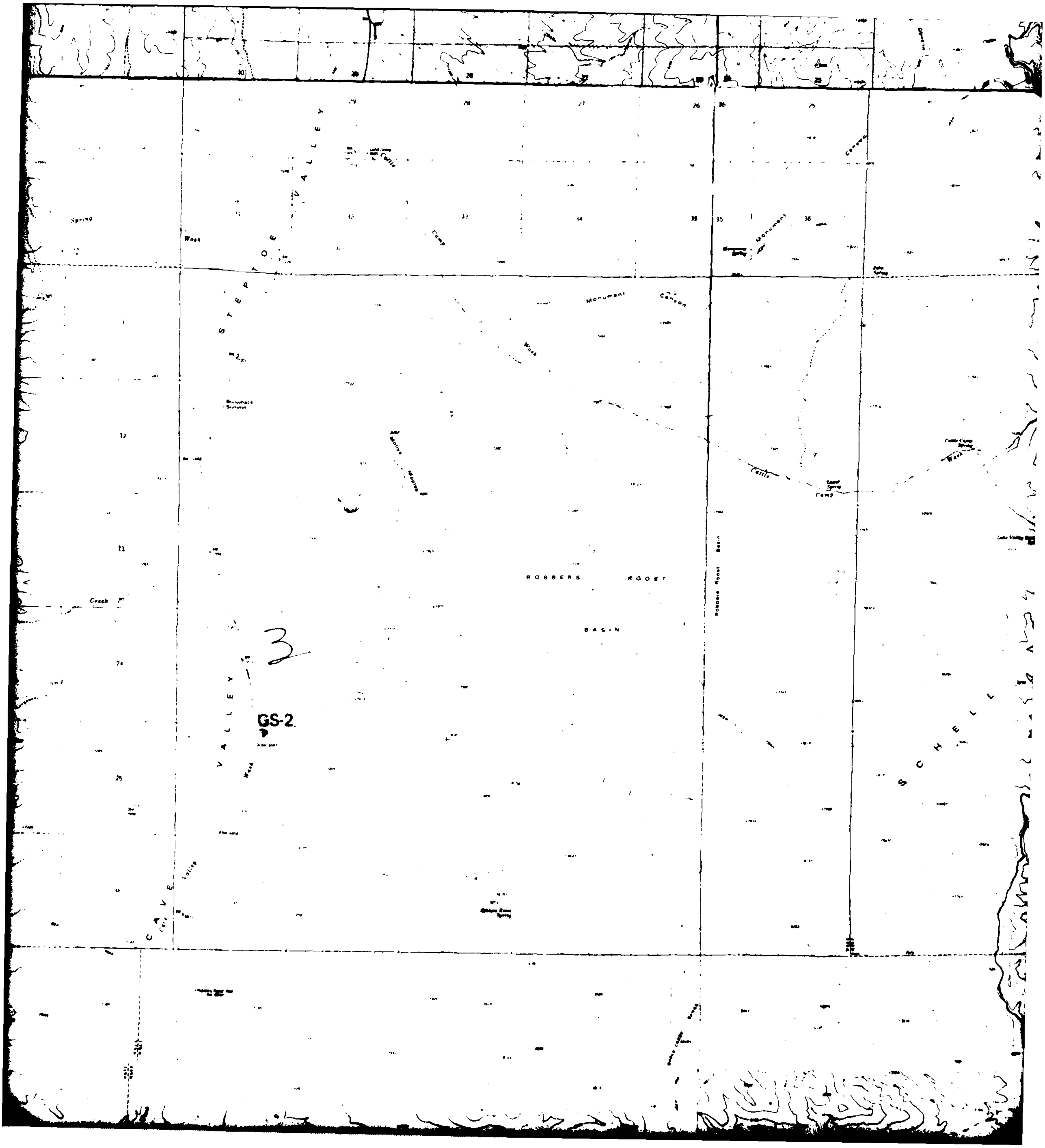
RANGE
Schoolhouse
Canyon
Basque
Canyon
Canyon
Ranch
Spring
Creek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Canyon
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BASIN
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GS-2
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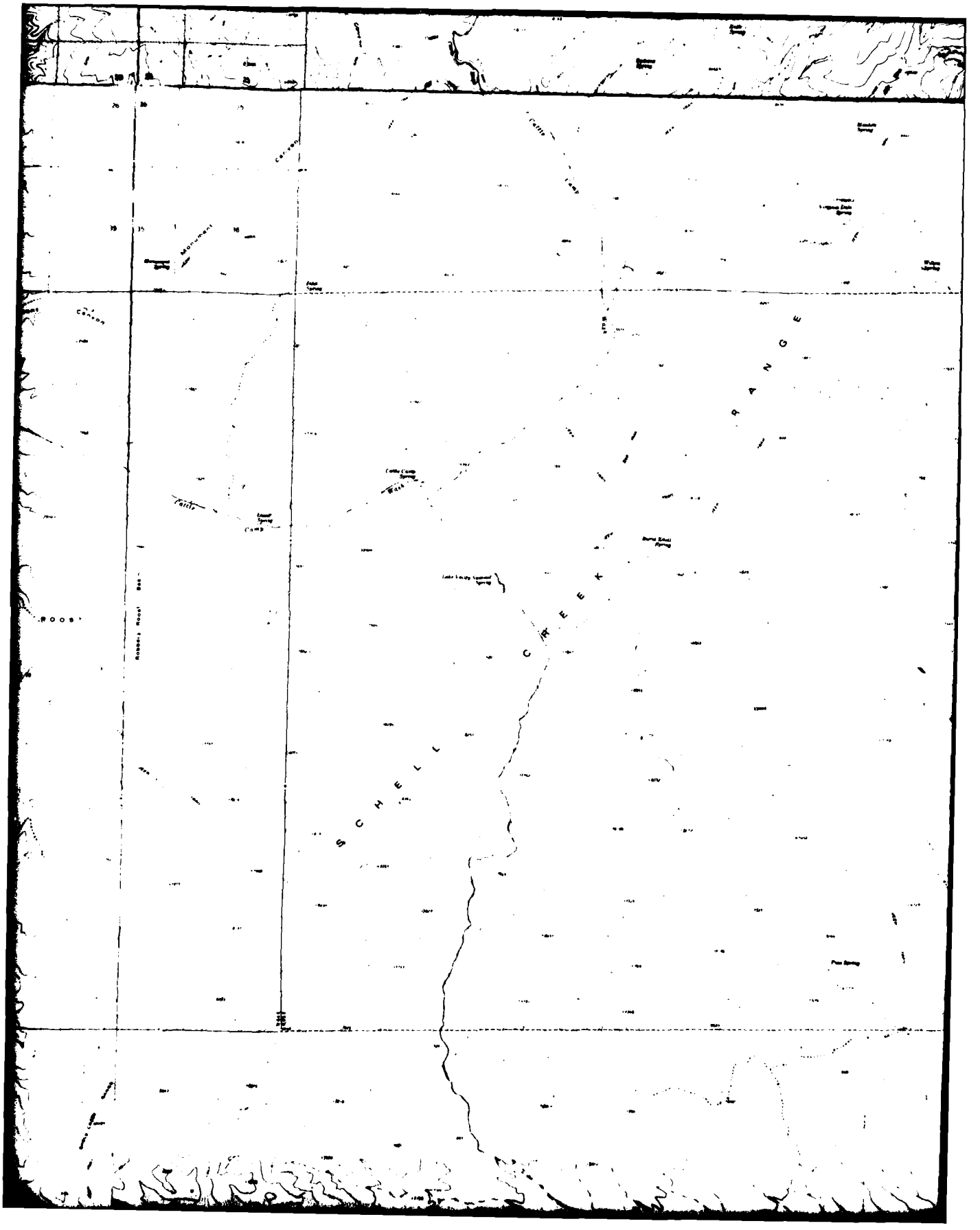
SCHELL
CAVE
Spring
Creek
3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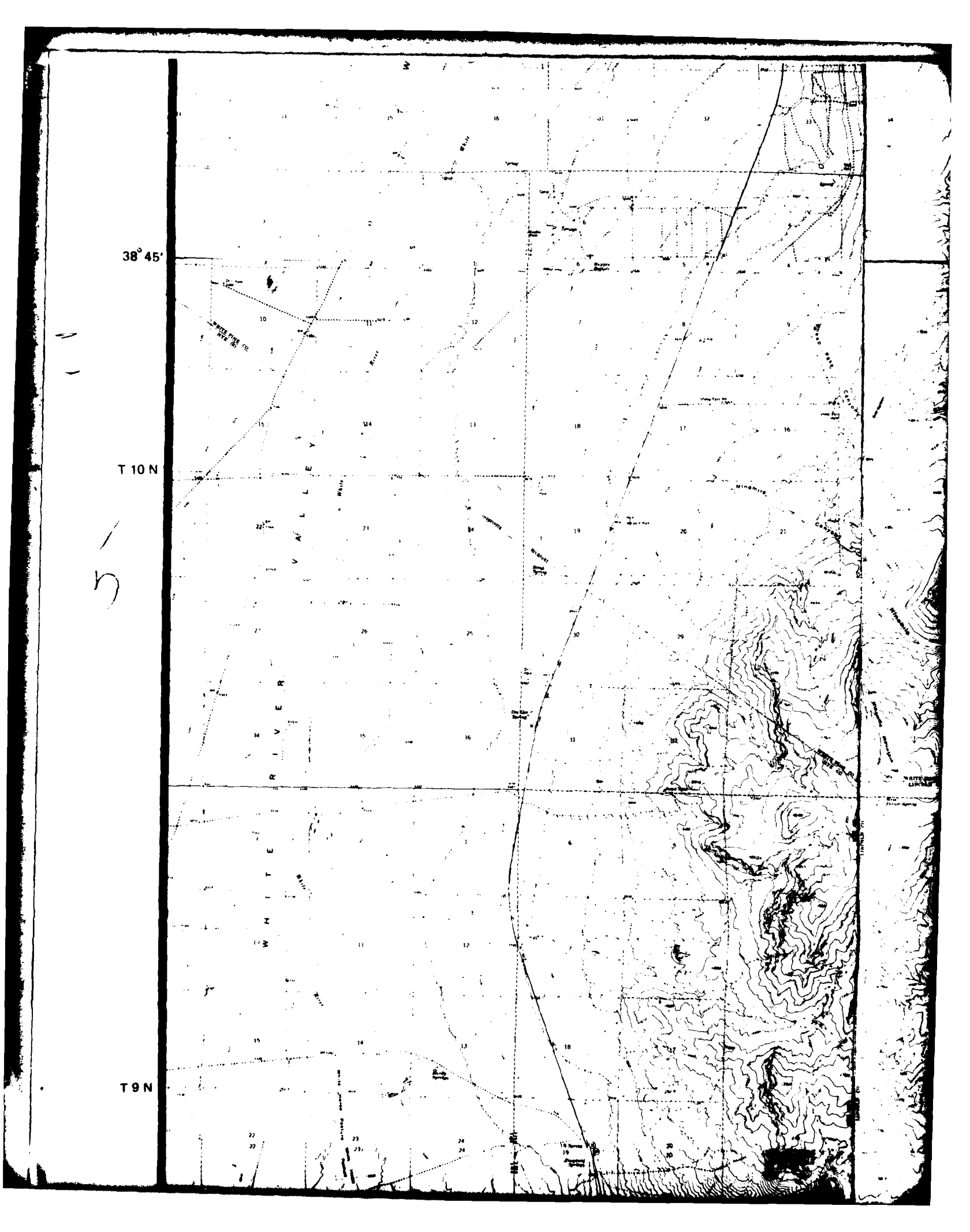
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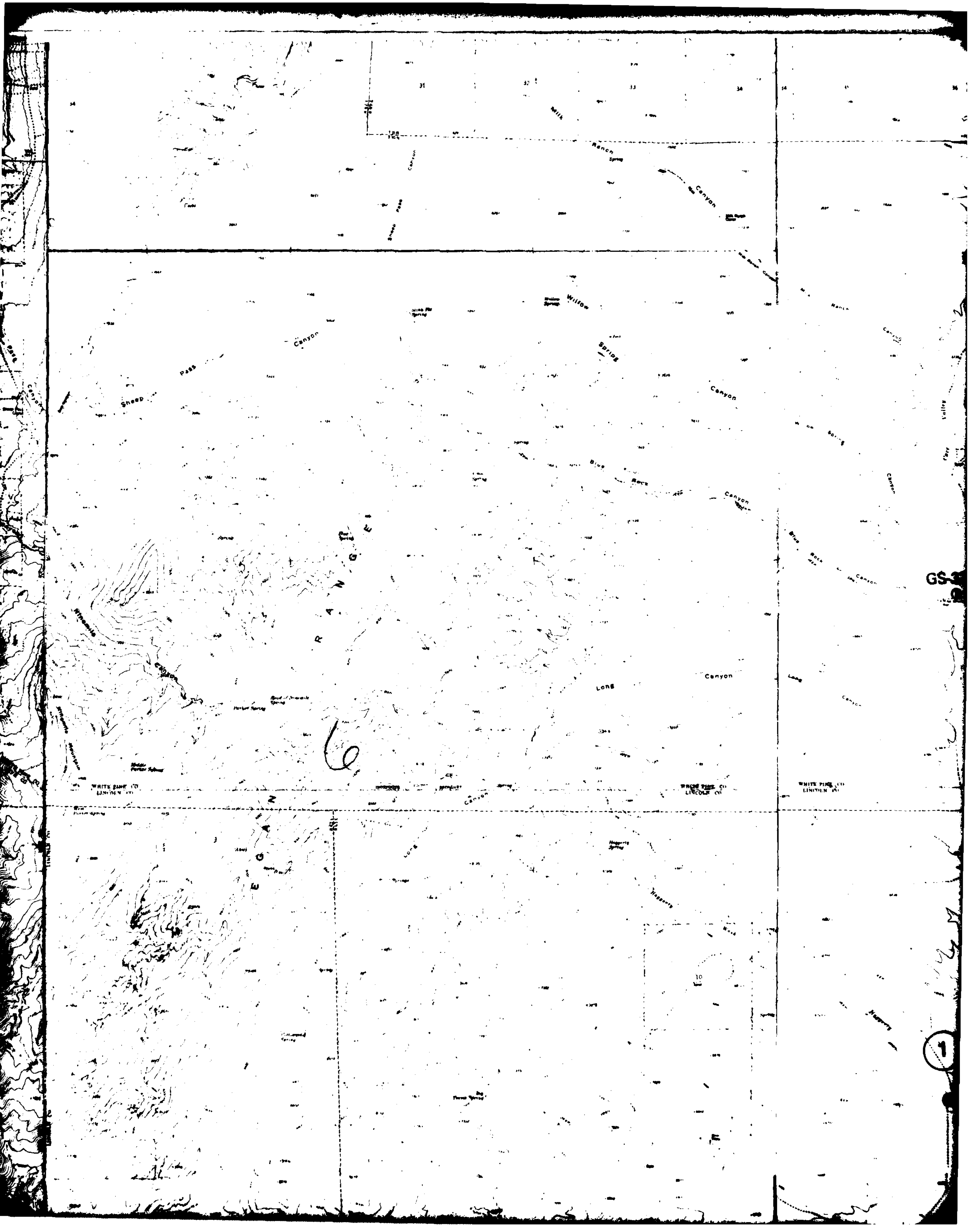
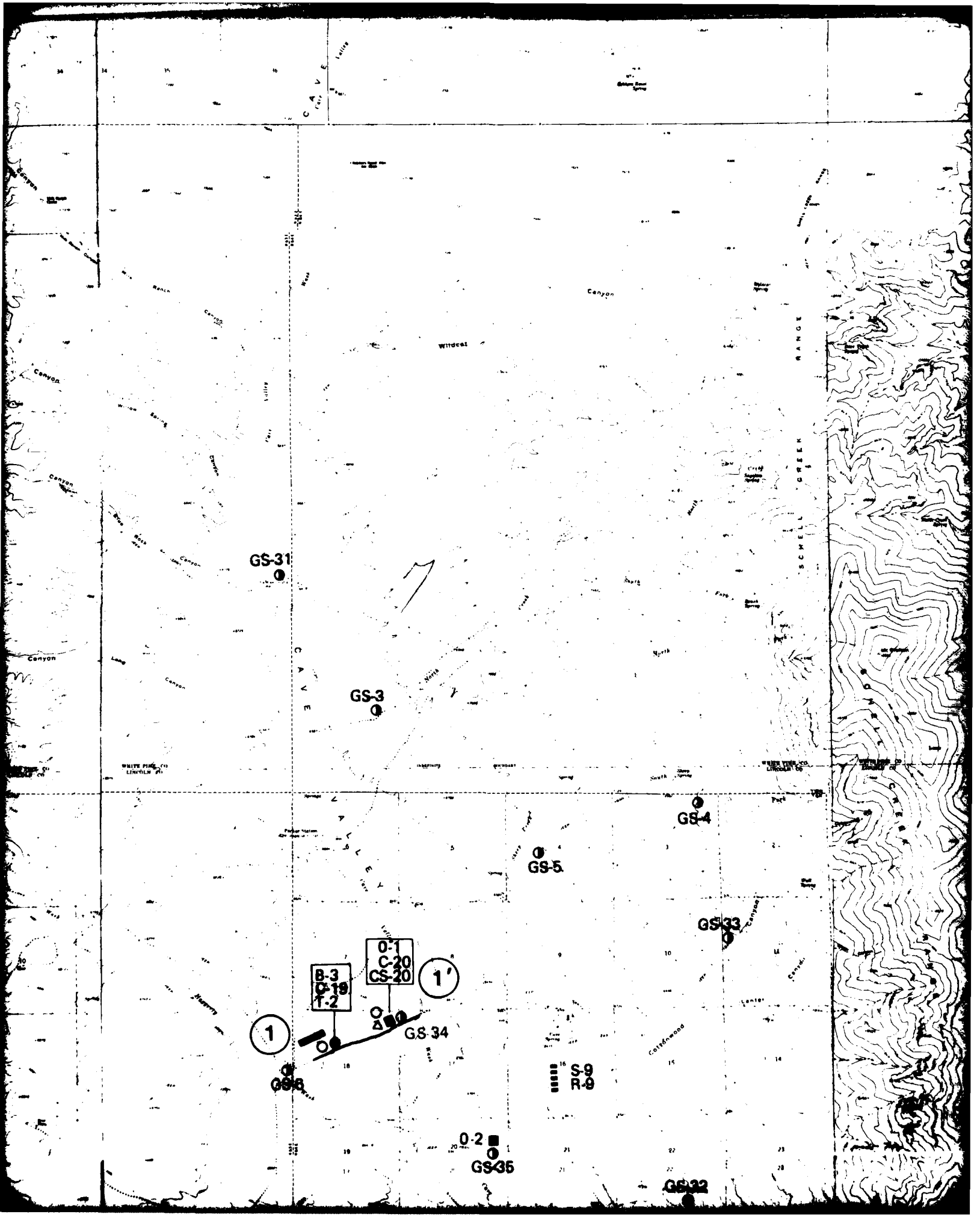
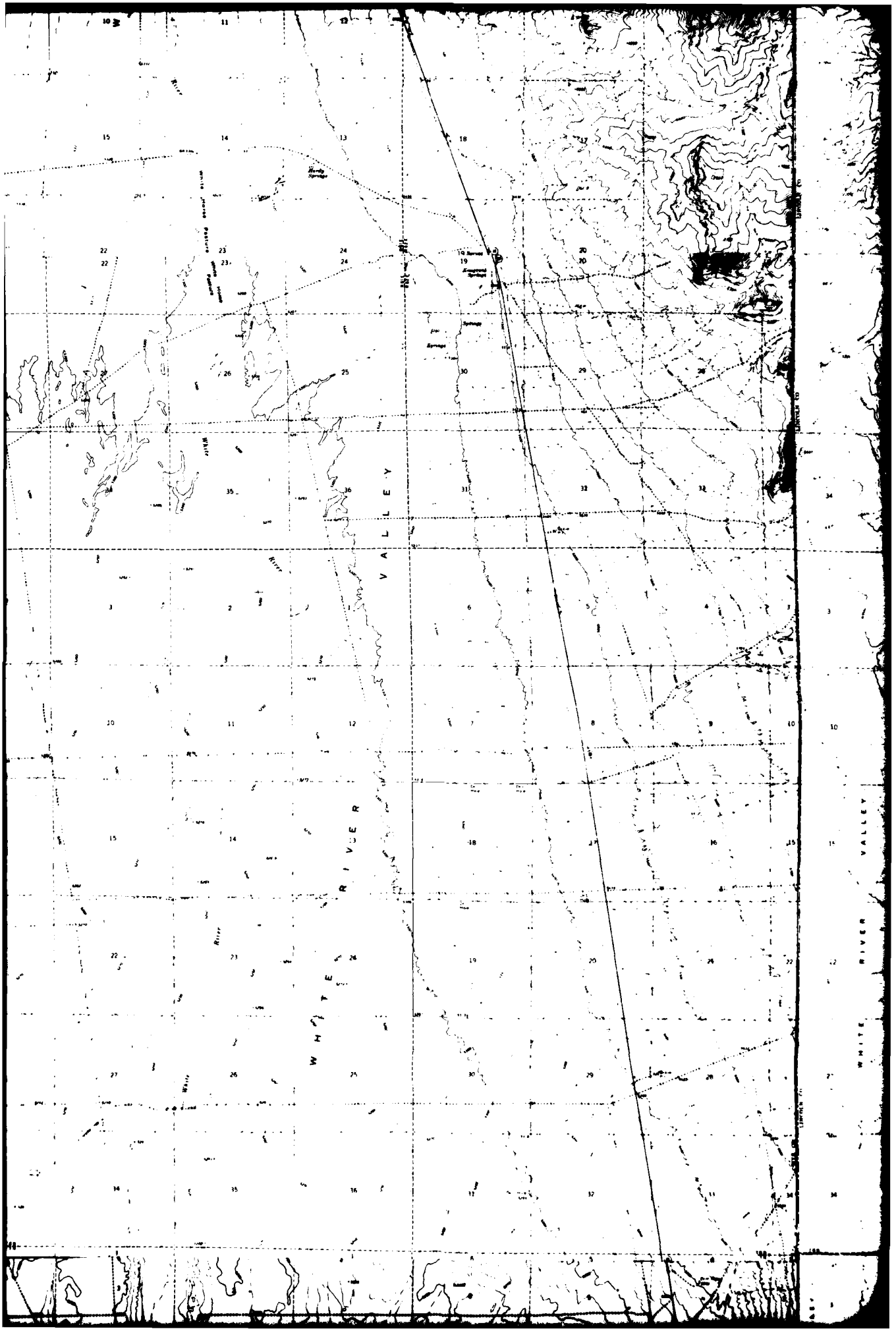
T 10 N
T 9 N
WHITE RIVER VALLEY
WHITE RIVER
Ninemile



Milk
Ranch
Spring
Canyon
Sheep
Pass
Canyon
Willow
Spring
Canyon
Blue
Rock
Canyon
R A N G E
Long
Canyon
WHITE PINE CO
LINCOLN CO
E G A N
Haggerty
Spring
GS-3
1
6


GS-31
GS-3
GS-4
GS-5
GS-33
GS-34
GS-36
GS-35
GS-32
0-1
C-20
CS-20
B-3
C-19
T-2
1
1'
S-9
R-9
0-2
CAVE
SCHELL CREEK RANGE
Wildcat
Canyon


SCHELL CREEK RANGE
GS-4
GS-33
GS-32
LAKE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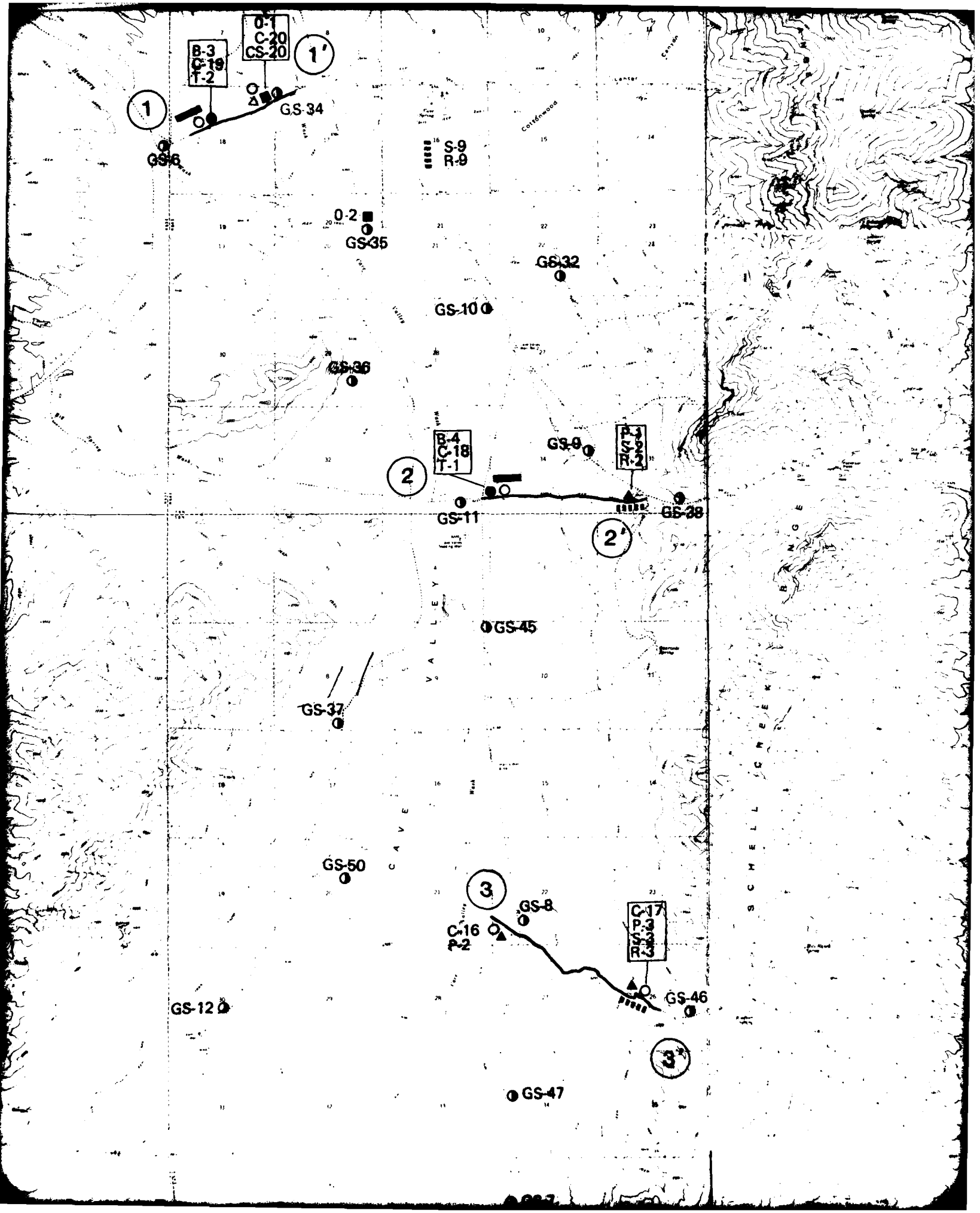
WHITE RIVER VALLEY


10
WHITE RIVER VALLEY


B-3
C-19
T-2
O-1
C-20
CS-20
1'
1
GS-34
GS-6
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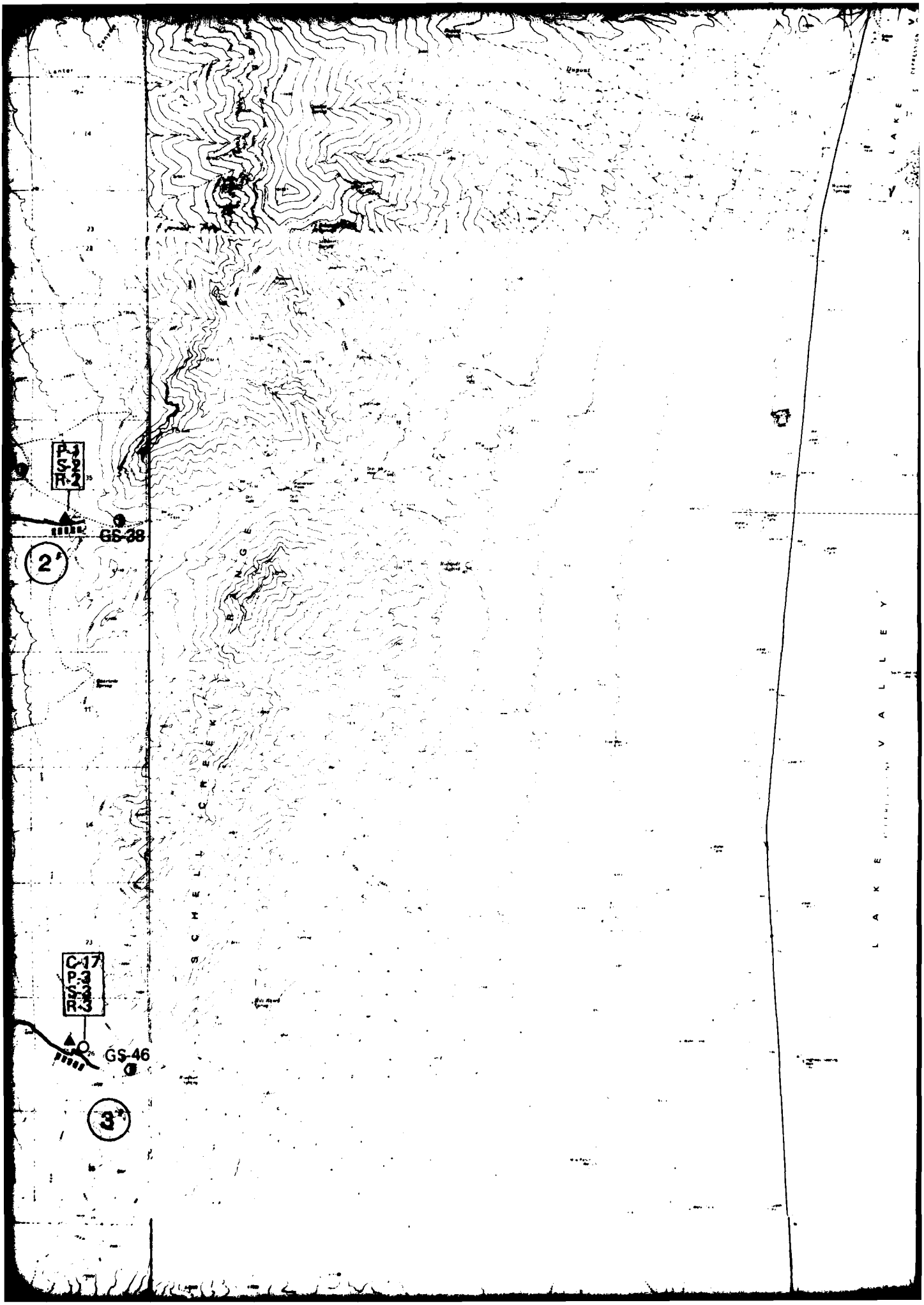
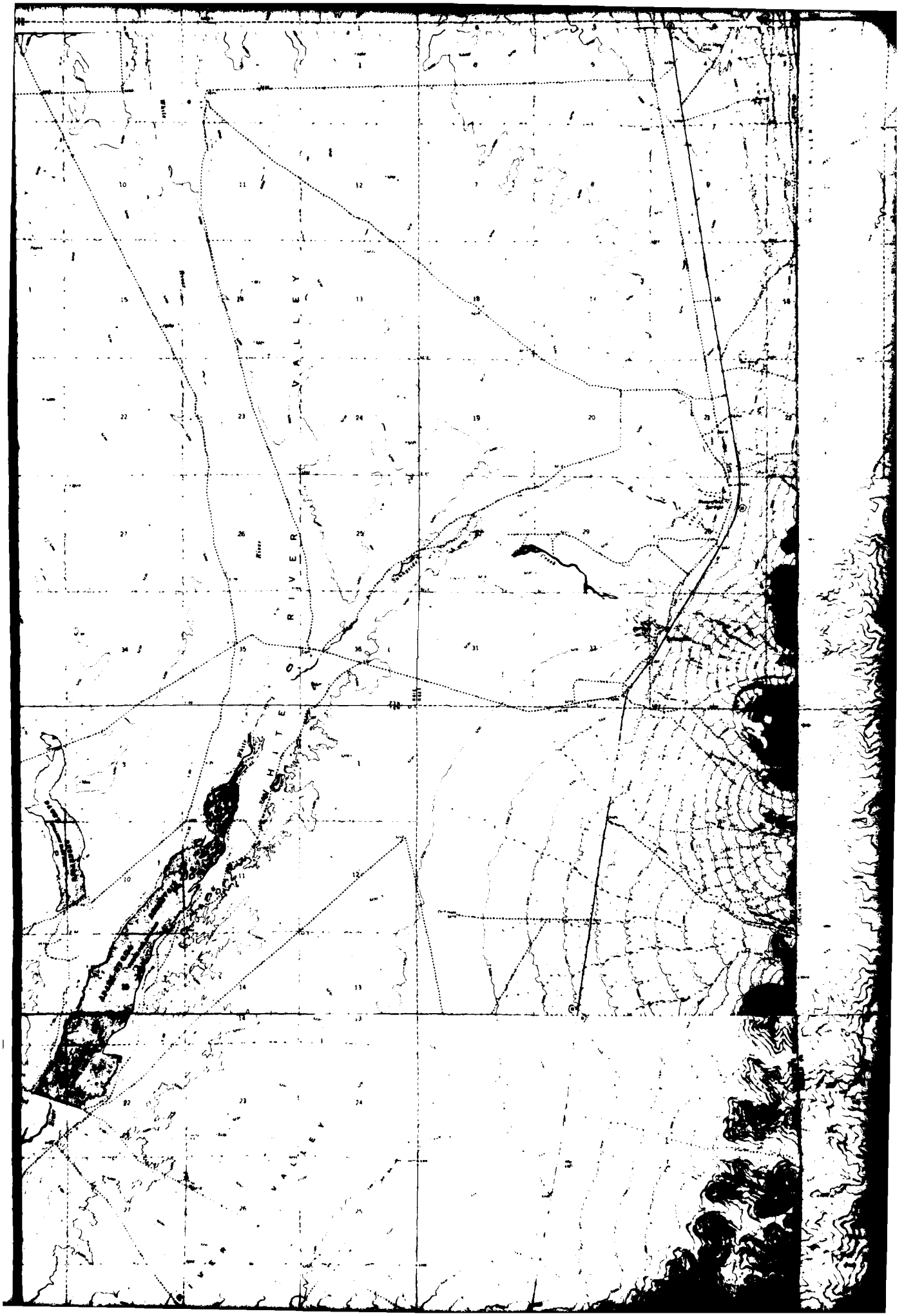
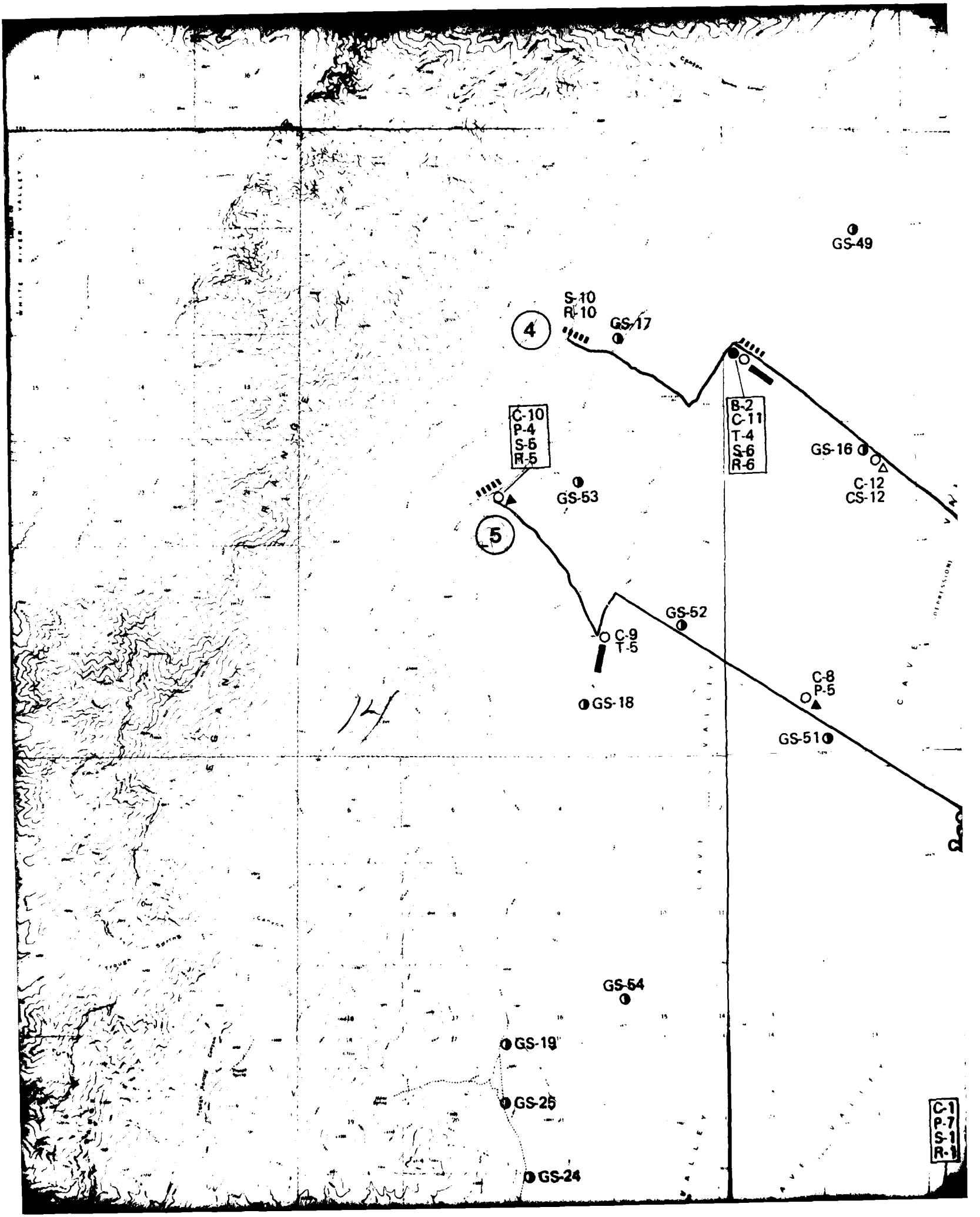
R-9
O-2
GS-35
GS-32
GS-10
GS-36
B-4
C-18
T-1
GS-9
P-1
P-2
R-2
2
GS-11
GS-38
2'
GS-45
GS-37
GS-50
3
GS-8
C-16
P-2
C-17
P-3
R-3
GS-46
GS-12
3'
GS-47
CAVE VALLEY
SCHELL CREEK RANGE


P-1
S-2
R-2
GS-38
2
C-17
P-3
S-3
R-3
GS-46
3
SCHELLBOURNE RANGE
LAKE VALLEY


WHITE RIVER VALLEY


GS-49
S-10
R-10
4
GS-17
B-2
C-11
T-4
S-6
R-6
C-10
P-4
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R-5
GS-16
C-12
CS-12
GS-53
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GS-52
C-9
T-5
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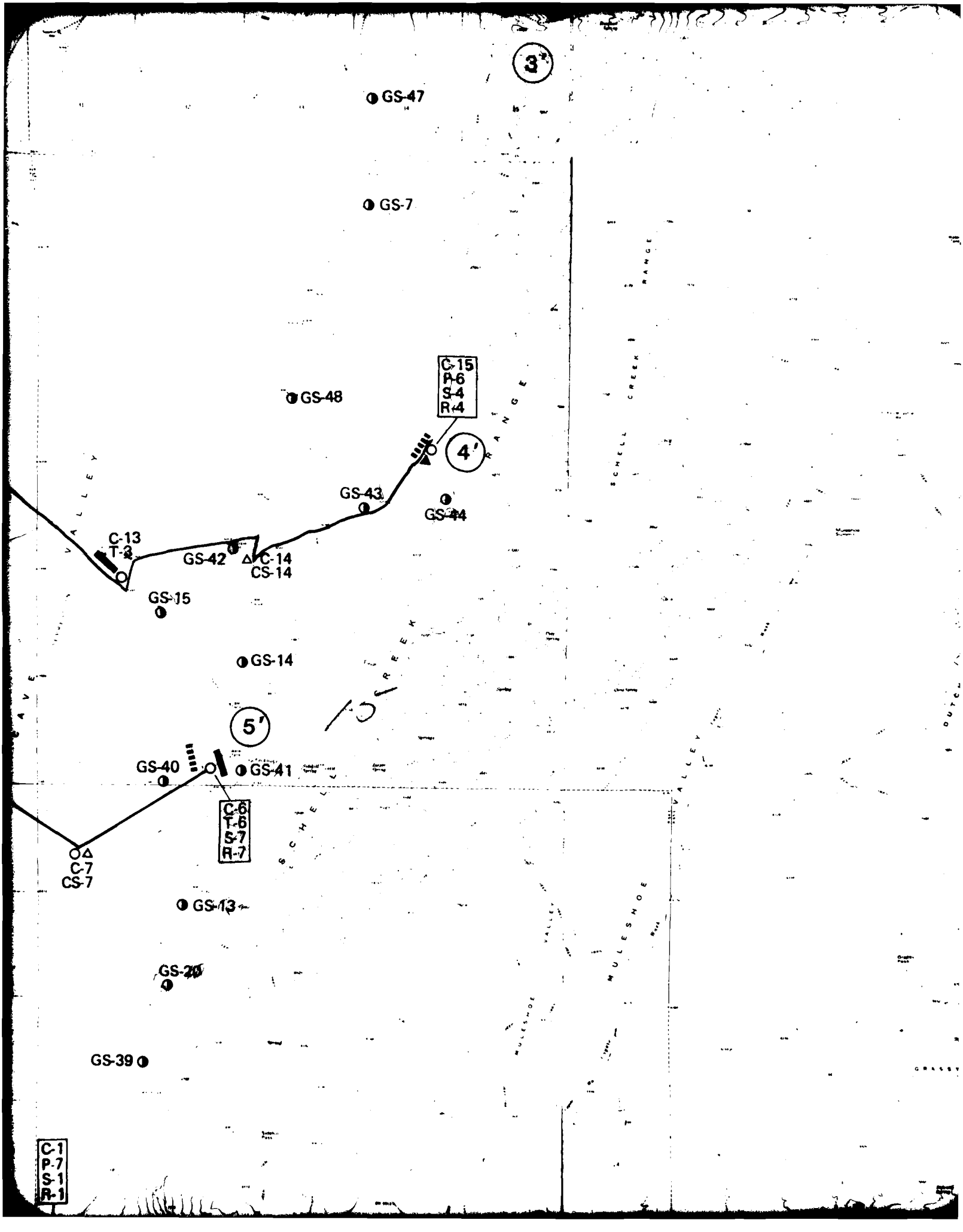
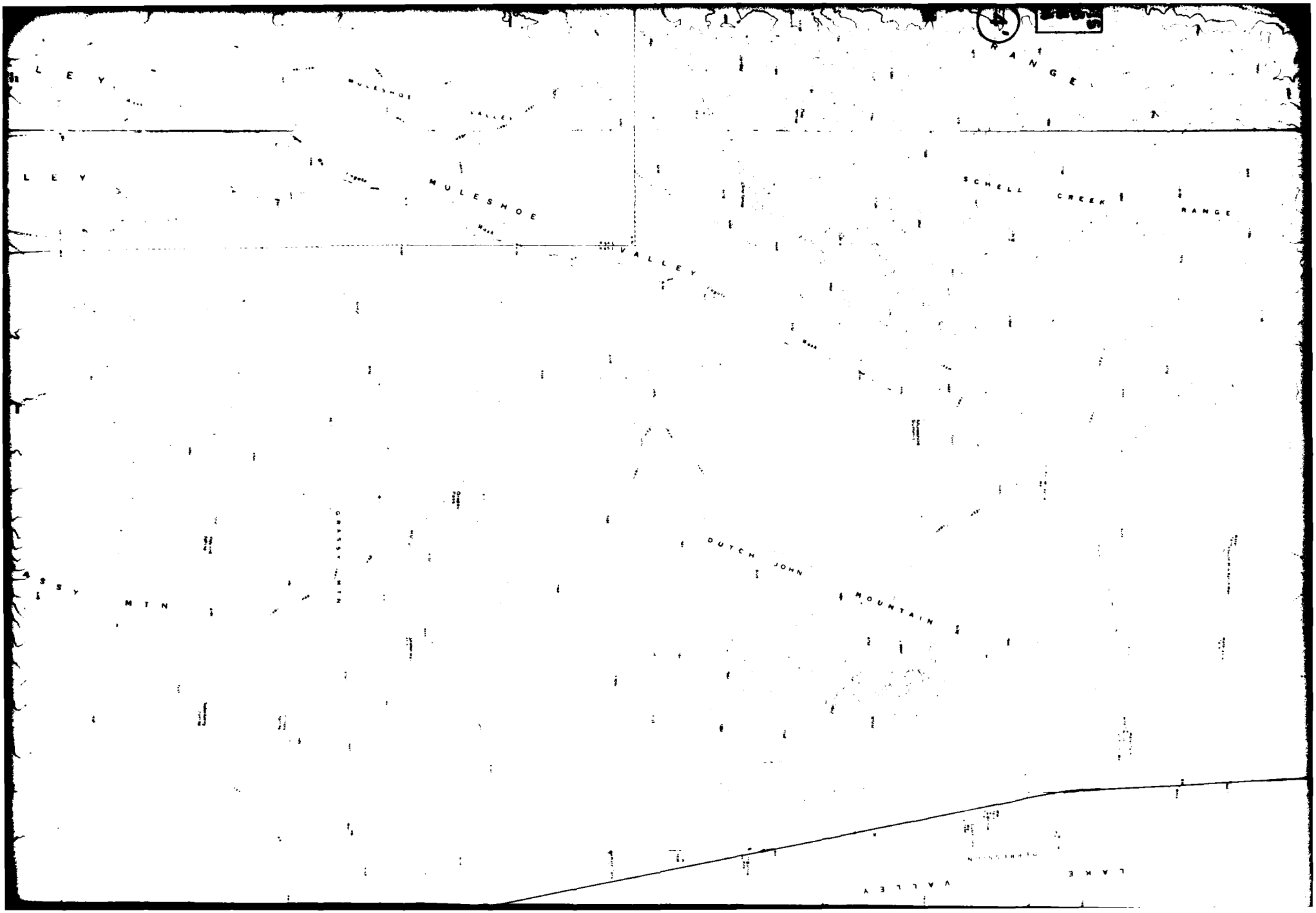
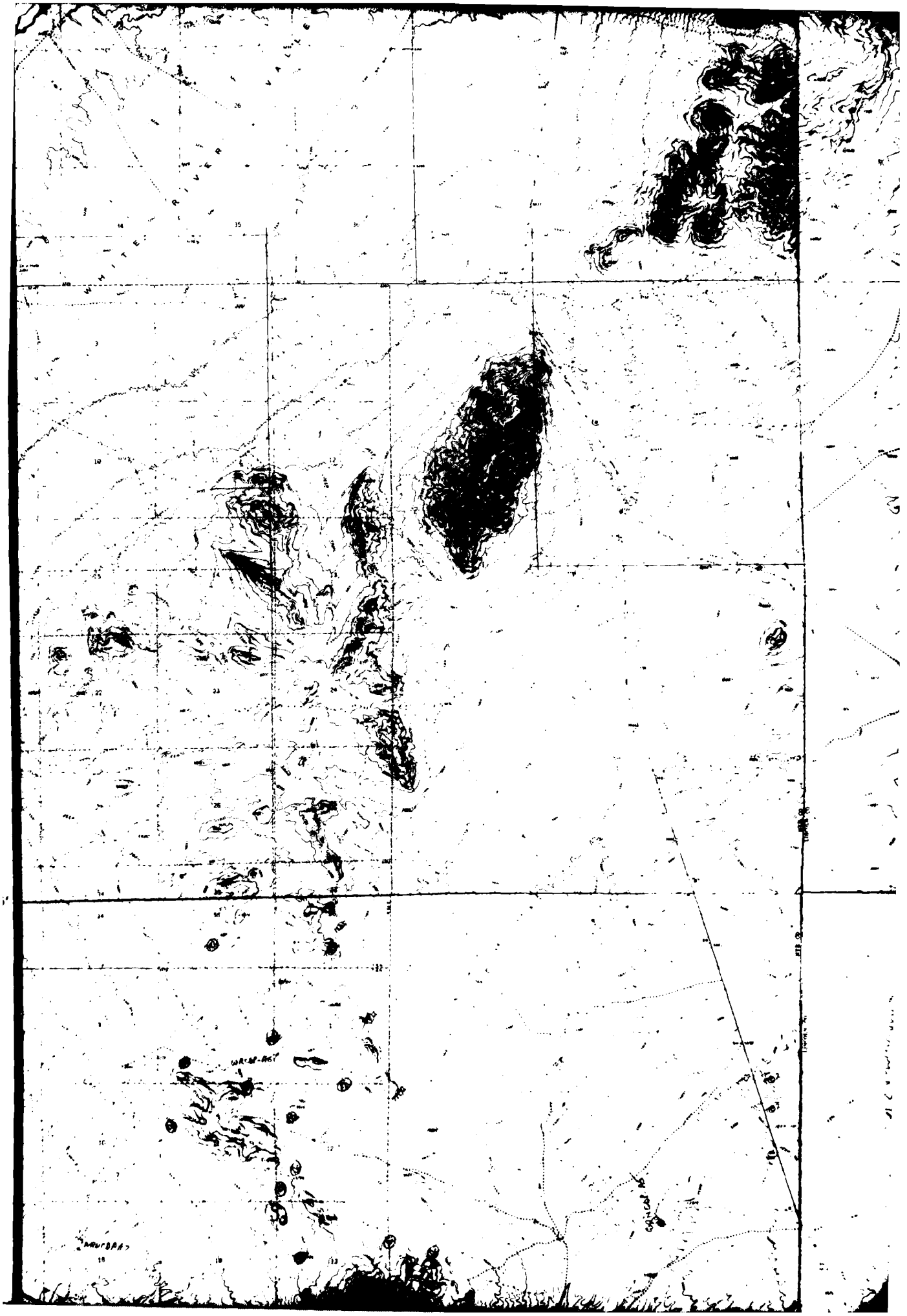
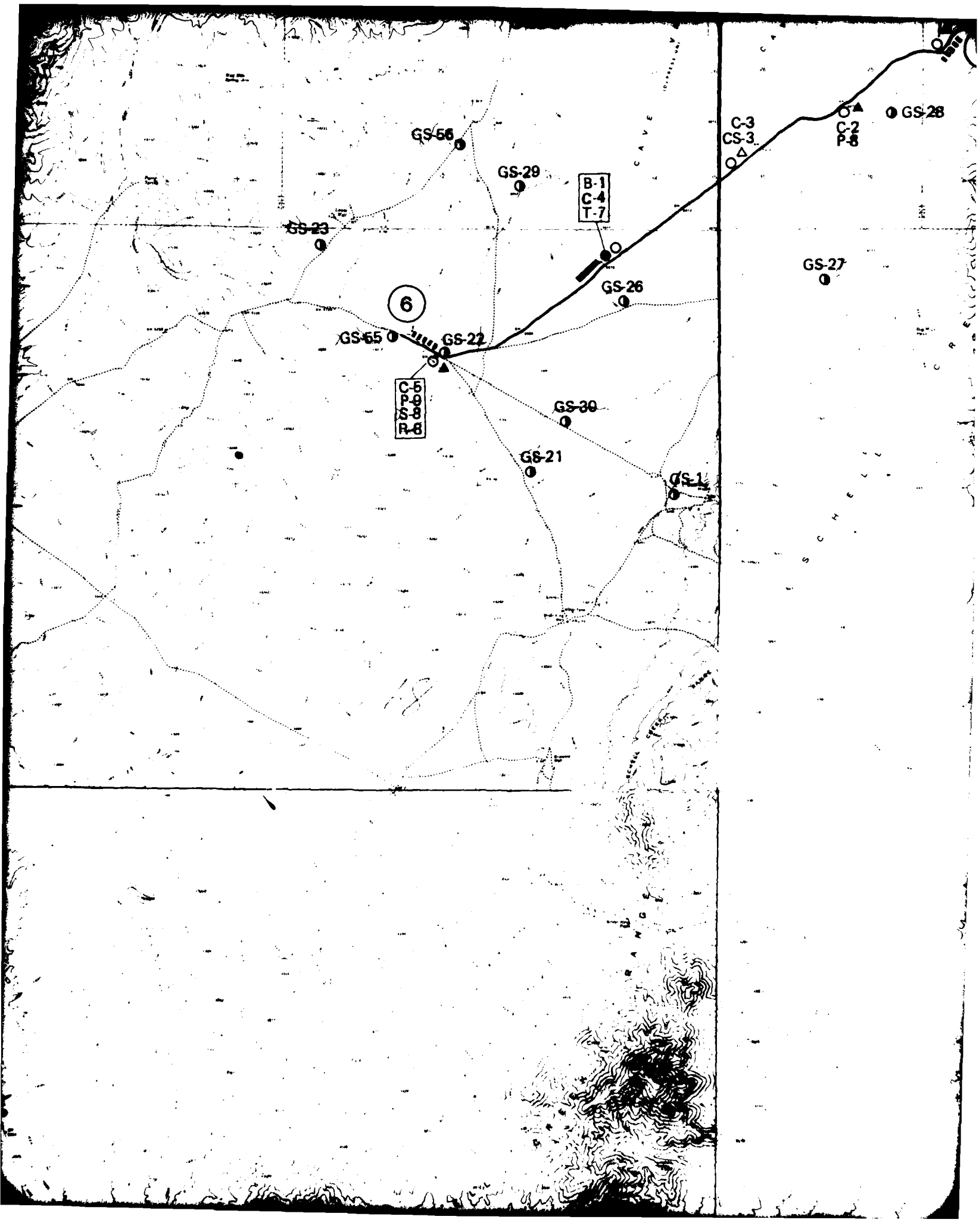
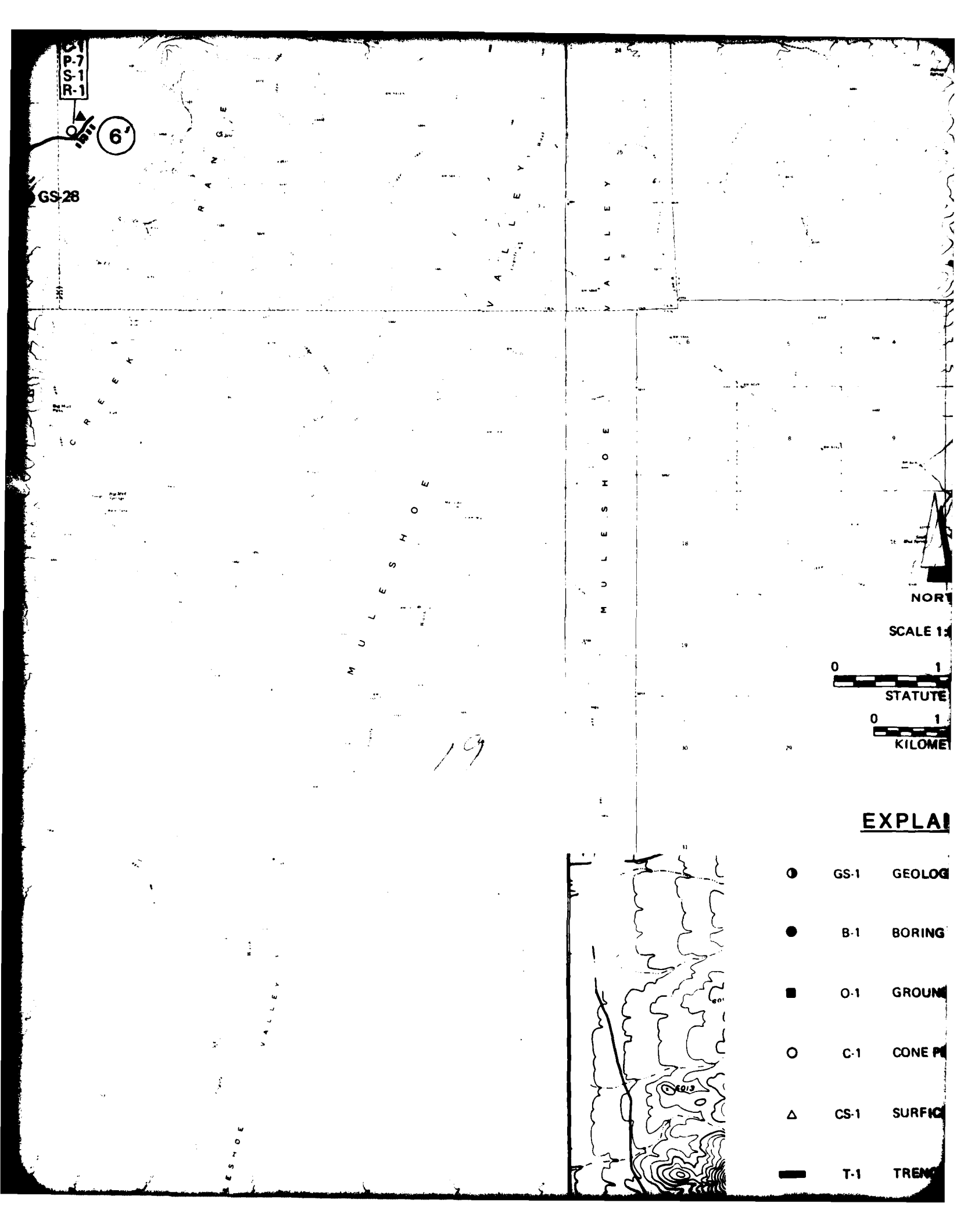
GS-25
GS-24
C-1
P-7
S-1
R-1

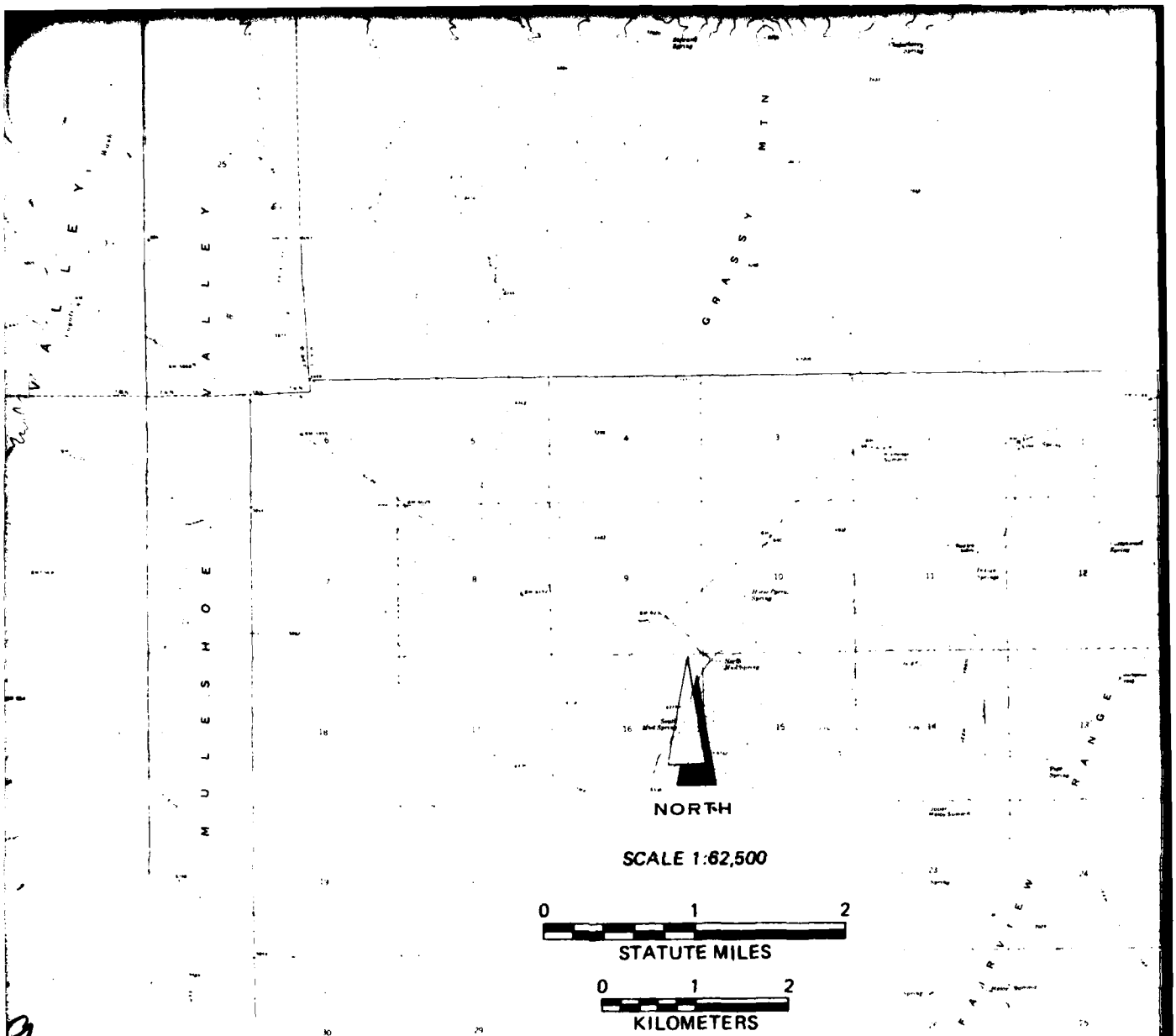

3'
GS-47
GS-7
C-15
P-6
S-4
R-4
GS-48
4'
GS-43
GS-44
C-13
T-3
GS-42
C-14
CS-14
GS-15
GS-14
5'
GS-40
GS-41
C-6
T-6
S-7
R-7
C-7
CS-7
GS-13
GS-20
GS-39
C-1
P-7
S-1
R-1
SCHELL CREEK RANGE
MULESHOE VALLEY


MULESHOE
VALLEY
SCHELL CREEK
RANGE
DUTCH JOHN
MOUNTAIN
GRASSY MTN
VALLEY
LAKE



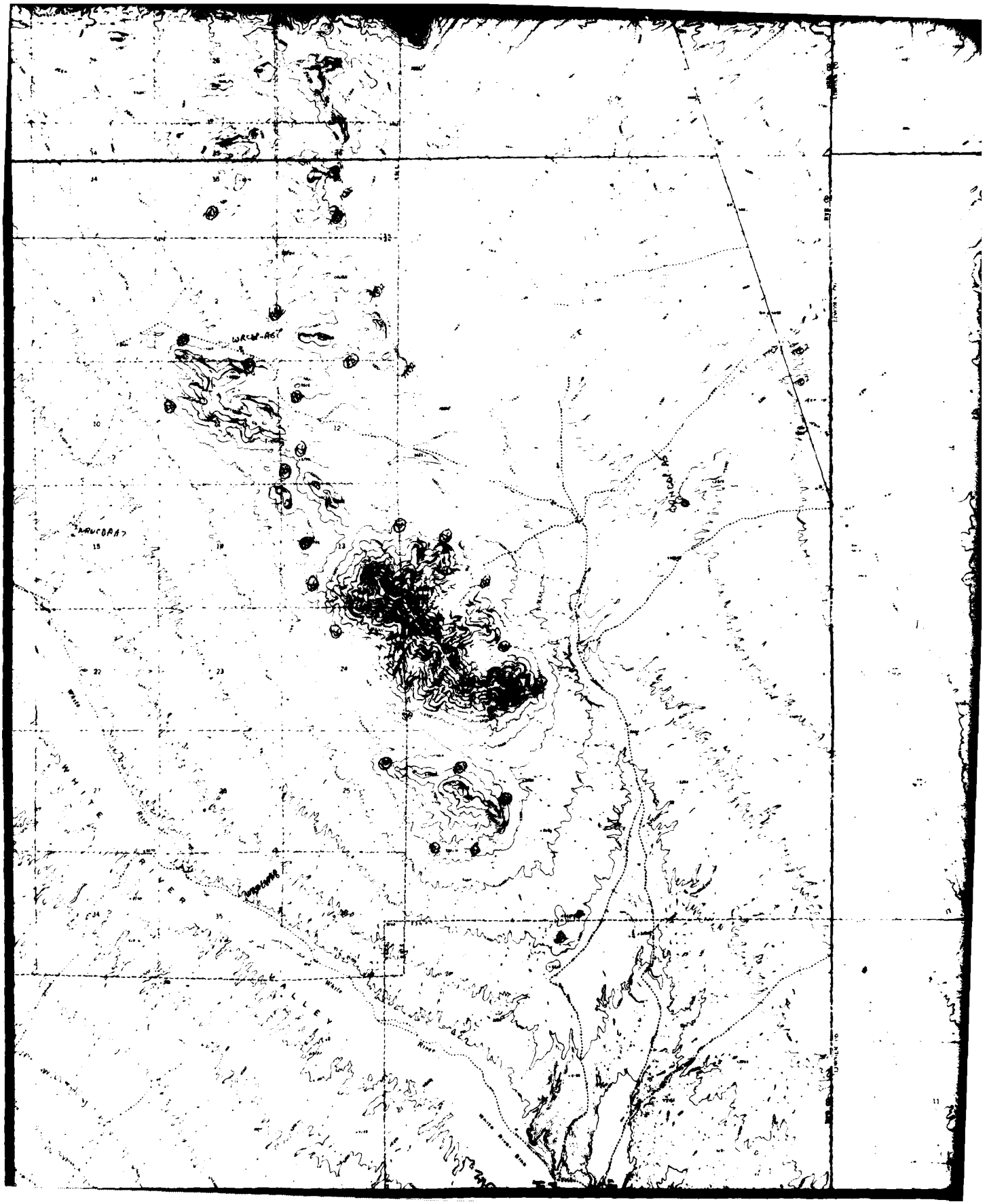

GS-56
GS-29
GS-23
B-1
C-4
T-7
C-3
CS-3
C-2
P-8
GS-28
GS-27
GS-26
6
GS-65
GS-22
C-5
P-9
S-8
R-8
GS-30
GS-21
GS-1

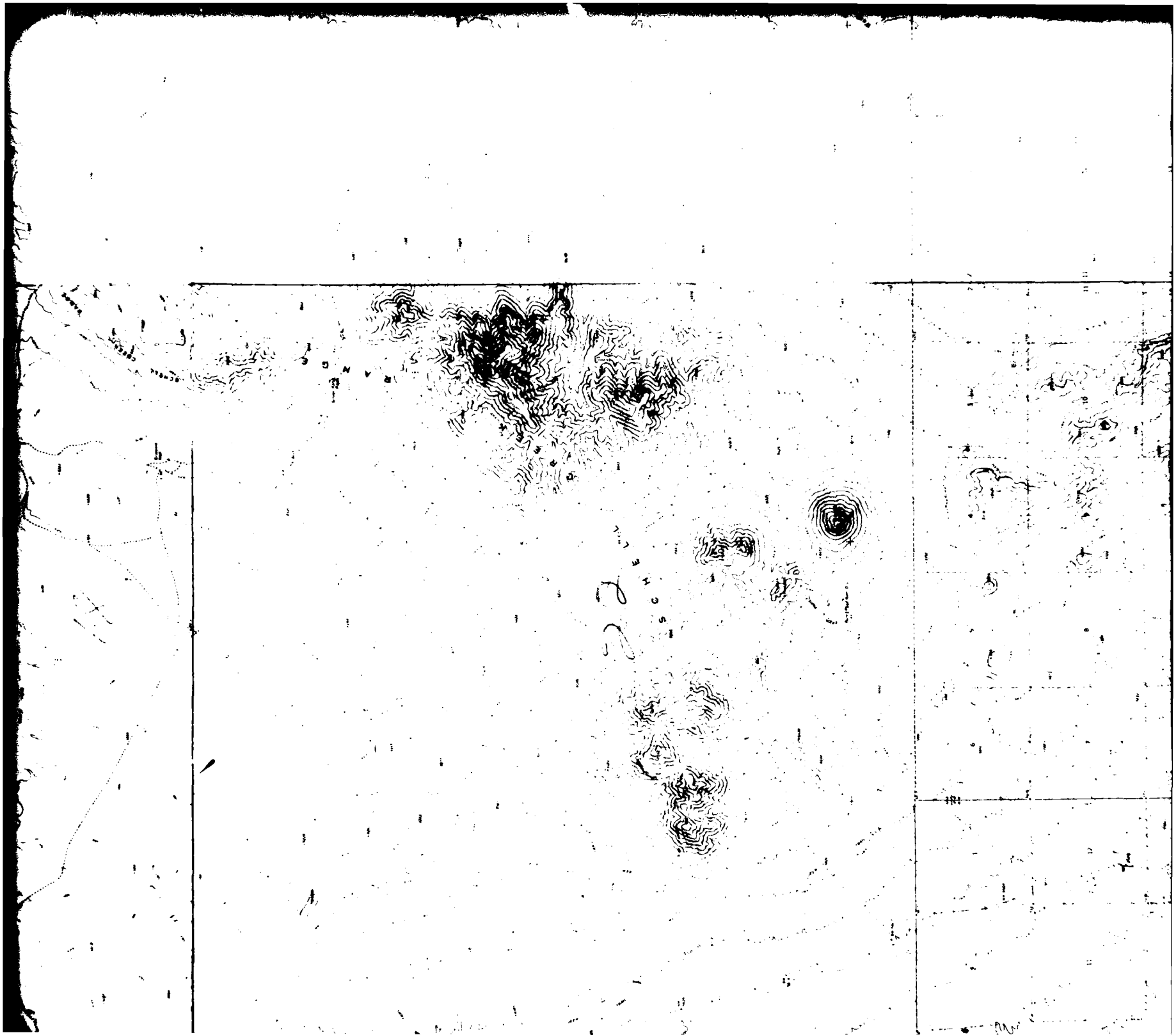

C-1
P-7
S-1
R-1
6
GS-28
MULESHOE VALLEY
MULESHOE
NORT
SCALE 1:
0 1
STATUTE
0 1
KILOME
EXPLA
GS-1 GEOLOG
B-1 BORING
O-1 GROUN
C-1 CONE P
CS-1 SURFIC
T-1 TREN



EXPLANATION

◑	GS-1	GEOLOGIC STATION
●	B-1	BORING
■	O-1	GROUND WATER LEVEL MEASUREMENT WELL
○	C-1	CONE PENETROMETER TEST (CPT)
△	CS-1	SURFICIAL SOIL SAMPLE
▬	T-1	TRENCH



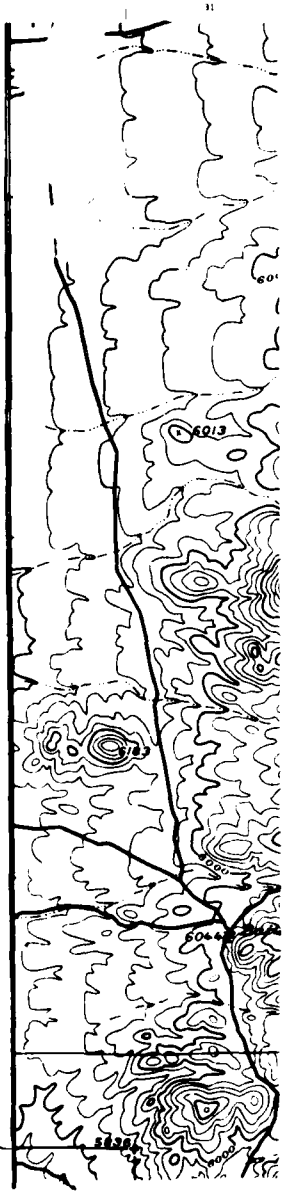


STAT

0

KILO

EXPLA



GS-1 GEOLO

B-1 BORIN

O-1 GROU

C-1 CONE

CS-1 SURFI

T-1 TRENC

P-1 TEST P

S-1 SEISM

R-1 ELECT

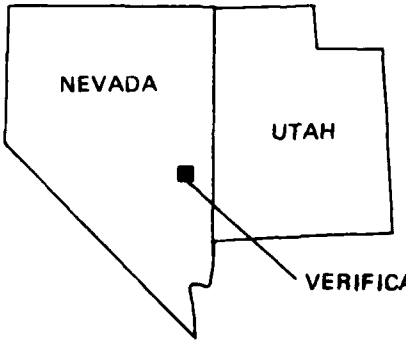
1 — 1' ACTIV

NOTE: Due to the exaggera
combination of sa
boring (1st) or the G
accurately located

MULESHOE VALLEY

23

LOCATION MAP



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ACTIVIT
CAVE V

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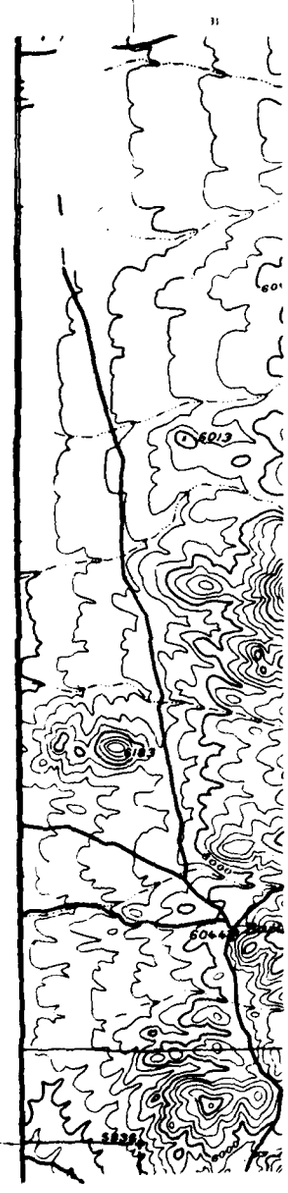
STATUTE MILES

0 1 2

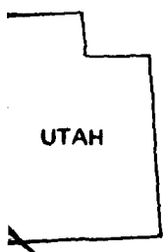
KILOMETERS



EXPLANATION

◑	GS-1	GEOLOGIC STATION
●	B-1	BORING
■	O-1	GROUND WATER LEVEL MEASUREMENT WELL
○	C-1	CONE PENETROMETER TEST (CPT)
△	CS-1	SURFICIAL SOIL SAMPLE
▬	T-1	TRENCH
▲	P-1	TEST PIT
▪▪▪▪▪	S-1	SEISMIC REFRACTION LINE
	R-1	ELECTRICAL RESISTIVITY LINE
1 — 1′		ACTIVITY LINE

NOTE: Due to the exaggeration of the map symbols, the exact location of any combination of activities, including geologic stations, is where either the boring (1st) or the CPT (2nd) is situated. Single activities are most accurately located nearest the center of the symbol.



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ACTIVITY LOCATION MAP
CAVE VALLEY, NEVADA

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DRAWING II-1-1

2.0 GEOLOGIC STATION DATA

Explanation: Detailed descriptions of surficial basin-fill deposits and/or rock units were recorded at geologic stations established at selected locations throughout the valley. All data taken on surficial basin-fill units at the geologic stations are listed in Table II-2-1, and an explanation of the column headings in the table is given below. An example of the field data sheet is shown in Figure II-2-1. At stations where rock descriptions were made, only geologic unit designations are listed. A general explanation of all geologic unit symbols used in Verification studies is included at the end of this section.

Column Heading Table II-2-2	Explanation
Station Number	Geologic stations are numbered sequentially. (e.g., NCVG001; N= Nevada-Utah Study Area; CV= Valley abbreviation [Cave]; G= Geology Station).
Geol. Unit	Generalized mapped geologic unit (see explanation below). The grain-size designations (s, g, and f) indicate sand, gravel, and fines, respectively.
MPS (mm)	Average Maximum Particle Size in millimeters.
Grain Size (%B, %C, %G, %S, %F)	Estimated particle size distribution using the Unified Soil Classification System. Percentages of boulders (%B) and cobbles (%C) are based on the entire deposit, whereas percentages of gravel (%G), sand (%S), and fines (%F) are taken only on the fraction composed of particles less than 3 inches (76 mm) in diameter. Note: The symbol Ø (occasional) indicates between 1 and 5 percent; zero indicates 0 to 1 percent.
*	Laboratory analyses of selected soil samples using the Unified Soil Classification System.

USCS	Soil class according to the Unified Soil Classification System.
Munsell Color	Soil color based on standard Munsell Soil Color Charts.
Source Rock Types	Rock types of coarse clasts (gravel) listed in order of abundance.
Physical Properties	Data listed in columns 6 through 15 address specific soil properties. These are listed below in parentheses following the column heading number and are also listed at the bottom of Table II-2-1. Data are coded with each numerical entry referring to a specific soil condition as listed below.

6	(Grain Shape)	1) Angular, 2) Subangular, 3) Subrounded, 4) Rounded, 5) Well rounded
7	(Moisture Content)	1) Dry, 2) Slightly Moist, 3) Moist, 4) Very Moist, 5) Wet
8	(Plasticity of Fines)	1) None, 2) Low, 3) Medium, 4) High
9	(Consistency)	Coarse grained: 1) Very Loose, 2) Loose, 3) Medium Dense, 4) Dense, 5) Very Dense Fine grained: 1)Soft, 2) Firm, 3) Stiff, 4) Hard
10	(Structure)	1) Non-stratified, 2) Stratified, tabular, 3) Stratified, other (lensed, cross bedded, discontinuous beds)
11	(Cementation-Induration)	1) None, 2) Weak, 3) Moderate, 4) Strong
12	(Depth to Cemented Layer)	Depth to layer (in centimeters) exhibiting cementation-induration described in Column heading 11 (above)
13	(Weathering of clasts)	1) Fresh, 2) Slight, 3) Moderate, 4) Very
14	(Soil Profile Development)	1) None (A-C profile), 2) Poor (incipient B-horizon), 3) Well (prominant B-horizon)
15	(Caliche Development)	1) None, 2) Stage I, 3) Stage II, 4) Stage III, 5) Stage IV

Terrain — Terrain information at the data location is broken into the following categories:

- Drainage Depth (ft) - Average depth of drainages (in feet)
- Drainage Width (ft) - Average width of drainage (in feet)
- Slope (%) - Average width of drainages (in feet)
- Sample - Number of samples taken

GENERALIZED GEOLOGIC UNITS

Explanation

Surficial Basin-fill Units

A1 Younger Fluvial Deposits - Major recent stream channel and floodplain deposits.

A2 Older Fluvial Deposits - Older incised stream channel and floodplain deposits in elevated terraces bordering major recent drainages.

A3 Eolian deposits - Windblown deposits of sand occurring as either thin sheets (A3s) or dunes (A3d).

A4 Playa and Lacustrine Deposits - Deposits occurring in modern, active playas (A4) or in either inactive playas or older lake beds and abandoned shorelines associated with extinct lakes (A4o).

A5 Alluvial Fan Deposits - Bodies of stream deposits whose surfaces approximate segments of cones or a coalescing set of cones which radiate downslope from mountain fronts. Old-age (A5o), intermediate-age (A5i) , and young-age (A5y) fans are differentiated on the basis of surface morphology, drainage pattern, soil development, induration/cementation, and where applicable, its surface expression relative to pluvial lake shoreline features.

A6 Plio-Pleistocene Sediments - Alluvial deposits locally composed of highly cemented gravels and sands near mountain fronts and/or pluvial deposits (sands and silts) from Pliocene lake beds. These deposits are distinguished from relatively younger units on the basis of surface morphology, soil development, degree of cementation and induration, and terrain conditions.

Grain sizes of these deposits are indicated by a single letter (f, s, or g) following the geologic unit symbol. These letters indicate the predominant grain size and range of soil types according to the Unified Soil Classification System.

f - fine-grained clays and silts (ML, CL, MH, CH)

s - sands (SP, SW, SM, SC)

g - gravels (GP, GW, GM, GC)

ROCK UNITS

I Igneous (undifferentiated) - Rocks formed by solidification of a molten or partially molten mass.

I1 Instrusive Rocks - Plutonic rocks formed by solidification of molten material beneath the surface (e.g., granite, granodiorite, diorite, gabbro).

I2 Extrusive Rocks (intermediate and acidic) - Volcanic rocks of intermediate and acidic composition formed by solidification of molten material at or near the surface, (e.g., rhyolite, latite, dacite, andesite).

I3 Extrusive Rocks (basic) - Volcanic rocks of basic composition, generally formed by solidification of molten materials at or near the surface (e.g., basalt).

I4 Extrusive Rocks (pyroclastic) - Rocks formed by accumulation of volcanic ejecta (e.g., ash, tuff, welded tuff, agglomerate).

S Sedimentary (undifferentiated) - Rocks formed from the consolidation of accumulated clastic materials, organic material, and/or chemically precipitated minerals.

S1 Arenaceous and/or Siliceous Rocks - Composed of sandsize particles (e.g., sandstone, orthoquartzite) or of cryptocrystalline silica (e.g., opal, chert).

S2 Carbonate Rocks - Composed predominantly of calcium carbonate formed by organic or inorganic precipitation (e.g., limestone, dolomite, chalk).

S3 Argillaceous Rocks - Composed of clay and silt-sized particles (e.g., siltstone, shale, claystone).

S4 Evaporite Rocks - Precipitated from solution as a result of evaporation (e.g., halite, gypsum, anhydrite, sylvite).

S5 Coarse Clastic Rocks - Composed of gravel sized or larger clasts (e.g., conglomerate, breccia).

M Metamorphic Rocks (undifferentiated) - Rocks formed through recrystallization in the solid state of preexisting rocks by heat and pressure.

M1 Coarse grained rocks formed by higher-grade regional metamorphism, either banded or granular (e.g., gneiss, granulite, amphibolite).

M2 Fine grained schistose rocks formed by lower grade regional metamorphism (e.g., schist, slate, phyllite).

M3 Nonfoliated rocks formed cheifly by contact metamorphism (e.g., hornfels, marble).

M4 Metaquartzite - rocks formed by metamorphism of highly siliceous rocks.

STATION NUMBER	GEOL UNIT	MPS MM	GRAIN SIZE %B	%C	%G	%S	%F		USCS	MUNSELL COLOR	SOURCE ROCK TYPES	PHYSICAL PROPERTIES 6	7	8	9	10	11	12	13	14	15	TERRAIN DRAINAGE(FT) DEPTH	WIDTH	SLOPE (%)	SAMPLE
CVGS0	A5IS	40	0	0	15	80	5		SP-SM	10.0YR4/4	S2	3	3	1	2	1	2	26	2	2	3	0.0	.	6	1
CVGS0	A5IS	70	0	0	5	70	25		SM	10.0YR6/4	S2	2	3	1	3	1	2	24	2	1	3	32.8	164.0	5	0
CVGS0	A5IS	200	0	0	40	40	20		GM-SM	7.5YR5/4	S1 S2	2	3	1	3	1	2		2	2	2	9.8	39.4	4	0
CVGS0	A5GG	700	0	40	60	40	0		GW		S1	3	5	1	3	1	1		2		2	9.8	49.2	12	0
CVGS0	A5IS	320	0	40	40	45	15		SM	7.5YR4/4	S1	3	3	1	3	1	2		2	2	2	4.9	26.2	5	0
CVGS0	A5IS	30	0	0	2	88	10		SP-SM	7.5YR4/4	I2 S2	3	3	1	3	1	4	22	2	3	5	16.4	49.2	1	0
CVGS0	A4OF		0	0	0	5	95		ML	10.0YR5/3			3	2	7	1	1			1	1	0.0	.		0
CVGS0	A5YS	62	0	0	1	60	39		SM	10.0YR4/3	S2	2	1	1	2	1	1		2	1	2	1.0	13.1	2	0
CVGS0	A5YS	52	0	0	10	88	2		SP	7.5YR5/6	S2	2	3	1	3	1	1		2	1	2	9.8	19.7	2	0
CVGS0	A5YS	180	0	0	35	60	5		SP-SM	7.5YR5/4	S1 S2	3	3	1	3	1	1		2	1	1	0.7	9.8	4	0
CVGS0	A1 F		0	0	0	5	95		ML-CL	10.0YR4/3			3	3	8	1	1			1	1	0.0	.		0
CVGS0	A5IS	23	0	0	10	65	25		SM	10.0YR6/6	S2	2	3	1	3	1	3	40	2	1	3	1.0	9.8	3	0
CVGS0	A4OS	60	0	0	40	45	15		SM	10.0YR4/6	S2	3	3	1	3	1	2		2	2	2	0.0	.		0
CVGS0	A4OS	30	0	0	45	47	8		SW-SM	10.0YR4/6	S2	3	3	1	3	1	2		2	2	2	0.0	.		0
CVGS0	A4OS	15	0	0	1	84	15		SM	10.0YR5/3	S1 S2	3	3	1	3	1	1		2	1	2	0.7			0
CVGS0	A4OS	0	0	0	0	95	5		SP-SM	10.0YR6/4		2	3	1	3	1	1			1		0.7			0
CVGS0	A5IS	110	0	0	5	70	25		SC	7.5YR5/4		2	3	2	3	3	3	29	2	2	4	3.3	16.4	3	0
CVGS0	A4OF	0	0	0	0	5	95		CL	10.0YR6/4			3	3	8	1	1			1	1	0.7	.		1
CVGS0	A5IS	121	0	0	35	55	10		SW-SM	10.0YR5/4		2	3	1	3	1	3	29	2	2	3	6.6	32.8	3	0
CVGS0	A4OG	100	0	0	60	25	15		GM		S2	3	3	2	2	1	1		2	1	2	0.0	.		0
CVGS0	A4OS	45	0	0	0	85	15		SM	10.0YR4/4		2	1	2	3	1	1		2	1	1	0.0	.		0
CVGS0	A5YS	35	0	0	3	92	5		SP-SM	10.0YR4/3	I2	3	3	1	3	1	1		3	1	1	1.0	3.3	2	1
CVGS0	A5OS	95	0	0	30	50	20		SM	10.0YR4/3	I2	2	3	2	2	1	3	26	2	2	4	16.4	49.2	4	0
CVGS0	A4OS	35	0	0	0	85	15		SM	10.0YR4/3		2	1	2	3	1	2	35		1	2	0.0	.		1
CVGS0	A5IS	70	0	0	30	65	5		SP-SM	10.0YR4/4	S2 I2	3	3	1	2	1	1		2	2	2	4.9	9.8	4	1
CVGS0	A4OF		0	0	0	30	70		ML	10.0YR6/3			1	2	7	1	2	29		1	2	0.0	.		1
CVGS0	A5YS	40	0	0	25	65	10		SP-SM	10.0YR4/3	S2	3	3	2	2	1	1		2	1	2	0.0	.	8	0
CVGS0	A5YG	90	0	0	50	45	5		GP-GM		S2	3	3	2	2	1	1		2	1	2	1.6	3.3	4	0
CVGS0	A4OS	50	0	0	40	56	4		SP	10.0YR4/3	S2 I2 S1	2	1	1	2	1	1		2	1	2	4.9	9.8		0
CVGS0	A4OG	50	0	0	45	25	30		SM		S2	2	1	3	3	1	1		2	1	2	0.3	9.8		0
CVGS0	A1 F		0	0	0	0	100	*	ML	10.0YR3/4			1	3	8	1	1			2	1	1.6	6.6	1	1
CVGS0	A5IG	100	0	5	50	40	10		GP-GM		S1 M2 S2 I2	2	1	1	2	1	1		2	2	2	1.6	3.3	8	0
CVGS0	A5GG	100	0	10	65	25	10		GP-GM		S1 I2	2	1	2	2	1	1		2	2	2	65.6	689.0	10	0
CVGS0	A1	70	0	0	30	30	40		ML	10.0YR4/4	S2 I2		1	3	8	1	1			1	3	1.6	3.3	2	0
CVGS0	A1 S	100	0	0	40	45	15		SM	10.0YR4/3	S2 I4 S1	2	1	3	2	1	1		2	2	2	3.3	6.6	1	0
CVGS0	A5I	130	0	0	35	35	30	*	GM-SM	10.0YR3/3	S2	2	1	1	2	1	2	30	3	2	4	1.0	3.3	8	1
CVGS0	A5YF	30	0	0	0	40	60	*	ML	10.0YR4/4			1	3	8	1	1			1	2	0.7	3.3	2	1
CVGS0	S2																								1
CVGS0	A5YF	30	0	0	0	40	60		ML	10.0YR5/3			1	3	8	1	1			1	2			2	0
CVGS0	A4OS	1	0	0	5	60	35	*	SM	10.0YR5/4		3	1	1	3	1	2	40		1	1			1	1
CVGS0	S2																								1
CVGS0	A4OG	75	0	0	60	35	5		GP-GM		S2 I2	2	1	1	2	1	1		2	1	2	0.0	.	.	0
CVGS0	A5IS	70	0	0	40	45	15		SM	10.0YR4/4	I4 S2	3	1	3	2	1	4	25	3	1	4	1.6	3.3	4	0
CVGS0	S2																								1
CVGS0	A5YS	85	0	0	20	65	15		SM		S2	2	1	2	3	1	1		2	1	3	1.6	6.6	3	0
CVGS0	S2																								1
CVGS0	A5Y	80	0	0	40	40	20		SM	10.0YR4/3	S2 S1	2	1	2	3	3	2	25	2	1	3	1.6	6.6	2	0
CVGS0	A5YS	15	0	0	1	59	40	*	SM	10.0YR4/3		2	1	2	3	1	1		2	1	2				1
CVGS0	A4OS	10	0	0	23	54	23	*	SM	10.0YR5/3	S2	2	1	2	3	1	1		2	1	1			1	1
CVGS0	A5YG	100	0	0	55	25	20		GM		S2 S1	3	1	2	2	3	2	70	2	2	2	1.6	3.3	1	0
CVGS0	A4OS		0	0	0	80	20		SM	10.0YR5/3		3	1	1	2	1	1			1	1	0.7	3.3		0
CVGS0	A4OS	2	0	0	2	53	45	*	SM	10.0YR6/3		3	1	1	2	3	1			1	1	0.3	.	0	1
CVGS0	S2																								1
CVGS0	A4OF		0	0	0	35	65		CL	10.0YR6/3			1	4	8	1	1			1	1	0.7	3.3	0	0
CVGS0	S2																								1
CVGS0	A5IS	110	0	10	15	50	35	*	SM	10.0YR3/4	S2 S1	2	1	3	3	1	2	32	1	1	3	3.3	9.8	4	1

EXPLANATION: PHYSICAL PROPERTIES

6: GRAIN SHAPE
7: MOISTURE CONTENT
8: PLASTICITY OF FINES
9: CONSISTENCY
10: STRUCTURE
11: CEMENTATION-INDURATION
12: DEPTH TO CEMENTED LAYER(CM)
13: WEATHERING OF CLASTS
14: SOIL PROFILE DEVELOPMENT
15: CALICHE DEVELOPMENT
NOTE: O=OCCASIONAL (1-5%)
NOTE: *=LAB DATA

Note: Refer to Figure II-2-1 for an explanation of the numerical values listed under the physical properties column.

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GEOLOGIC STATION DATA
CAVE VALLEY, NEVADA

26 OCT 81

TABLE II-2-1

E-TR-27-CV-II

Station No. (CSR/VALLEY/CLA/STATION # — cols 1–7) _____ Described Geol. Unit (UNIT / GS — cols 8–11) _____

Date _____ Complete Geol. Unit _____

Observers _____ Field Photo Nos. _____

Air Photo No. _____ Sample (No=0, Yes=1) [12] _____

SOIL PROPERTIES

1. Grain-Size Distribution: MPS (mm) - grain size of coarsest fraction; boulders and cobbles - percent of total; gravel, sand, and fines - percent less than 3 inches. (MPS | B | C | G | S | F — FIELD cols 13–19; LAB cols 20–27)

2. USCS Symbol [28–31]

3. Descriptive Name (one adjective only) _____

4. Munsell Color (not applicable to gravel) [32 33 . 34 35 36 37 / 38]

5. Lithology of gravel, cobbles, boulders: give rock type (I1, I2, M, etc.) in order of abundance. [39–48]

6. Grain Shape (coarse grained soil only): 1) Angular, 2) Subangular, 3) Subrounded, 4) Rounded, 5) Well-rounded. [49]

7. Moisture Content: 1) Dry, 2) Slightly moist, 3) Moist, 4) Very moist, 5) Wet [50]

8. Plasticity of Fines: 1) None, 2) Low, 3) Medium, 4) High [51]

9. Consistency: [52]
   Coarse-grained: 1) Very Loose, 2) Loose, 3) Medium Dense, 4) Dense, 5) Very Dense
   Fine-grained: 6) Soft, 7) Firm, 8) Stiff, 9) Hard

10. Structure: 1) Non-stratified-(homogeneous), 2) Stratified-tabular, 3) Stratified-other; if 3) describe _____ [53]

11. Cementation-Induration: 1) None, 2) Weak, 3) Moderate, 4) Strong [54]

12. Depth to Cemented Layer (cm) [55–57]

13. Weathering of boulders, cobbles, and gravel: 1) Fresh, 2) Slight, 3) Moderate, 4) Very [58]

14. Degree of Soil Profile Development: 1) None (A-C profile), 2) Poor (incipient B-horizon), 3) Well (prominant B-horizon) [59]
    Describe _____

15. Degree of Caliche Development: 1) None, 2) Stage I, 3) Stage II, 4) Stage III, 5) Stage IV [60]
    Describe _____

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FIELD DATA SHEET
PAGE 1 OF 2

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FIGURE II-2-1

3.0 GROUND-WATER DATA

Explanation: Existing ground-water data in Cave Valley were collected from all available sources. These data were updated where possible from measurements taken during Ertec field operations, and all data are shown in Table II-3-1. Locations of water wells drilled by Ertec Western, Inc. are shown in Drawing II-1-1. Data from published water wells and wells drilled by Ertec Western, Inc. are shown in Drawing 3-4. Well numbers listed in the left hand column of Table II-3-1 refer to well locations shown on Drawing 3-4. Actual well numbers giving location, according to the Bureau of Land Management Land Survey System (Figure II-3-1), are shown in the second column.

Water levels generally refer to the static ground-water table in the unconfined basin-fill aquifer. Perched conditions or levels in artesian aquifers are noted where known.

WELL NO.	WELL LOCATION NUMBER * (Twp-Rge-Sec)	ELEVATION OF GROUND SURFACE FEET (METERS) ABOVE M.S.L.	DEPTH OF WELL FEET (METERS)	WATER LEVEL			REFERENCES**/ REMARKS
				DEPTH BELOW GROUND SURFACE-FEET (METERS)	DATE MEASURED	ELEVATION-FEET (METERS) ABOVE M.S.L.	
W1	N11/63E-25b	7040 (2146)	5015 (1529)	–	8-67	–	3
W2	N10/63E-25ab	6620 (2018)	20 (6)	20 (6)	3-80	6600 (2012)	5 (1)
W3	N9/63E-1aa	6560 (1999)	–	2 (0.6)	1962	6558 (1999)	1
W4	N9/64E-6bd	6490 (1978)	–	Flowing 2-3gpm	3-80	6490 (1978)	5
W5	N9/63E-22ab	6790 (2069)	6264 (1909)	–	5-65	–	3
W6	N9/64E-27bc	6400 (1951)	315 (96)	239 (73)	3-80	6161 (1878)	5 (2)
W7	N8/64E-4a	6220 (1897)	–	141 (43)	3-80	6079 (1853)	5
W8	N8/64E-15bc	6159 (1877)	375 (114)	280 (85)	3-80	5879 (1792)	5
W9	N8/64E-30cd	6080 (1853)	–	322 (98)	3-80	5758 (1755)	5 (1)
W10	N7/63E-15db	6020 (1835)	385 (117)	233 (71)	3-80	5787 (1764)	5 (1)
W11	N7/64E-19dda	6000 (1829)	265 (81)	215 (66)	3-80	5785 (1763)	5 (2,3)
W12	N7/63E-29bd	6320 (1926)	488 (149)	288 (88)	8-70	6032 (1839)	4
O-1	N9/64E-18aa	6435 (1961)	101 (31)	Dry	11-80	–	5
O-2	N9/64E-20ad	6350 (1935)	200 (61)	Abandoned	7-80	–	5
WRO-1	N7/63E-14ab	6010 (1832)	452 (138)	231 (70)	8-80	5779 (1761)	5

* MOUNT DIABLO BASELINE MERIDIAN

** REFERENCES

1. EAKIN, 1962.
2. NEVADA STATE ENGINEERS WELL LOGS.
3. SHILLING AND GARSIDE, 1968.
4. GARSIDE AND OTHERS, 1977.
5. ERTEC WESTERN FIELD MEASUREMENT, 1980, AND WATER RESOURCES STUDY.

PARENTHETICAL REFERENCES INDICATE ORIGINAL WELL LOGS.

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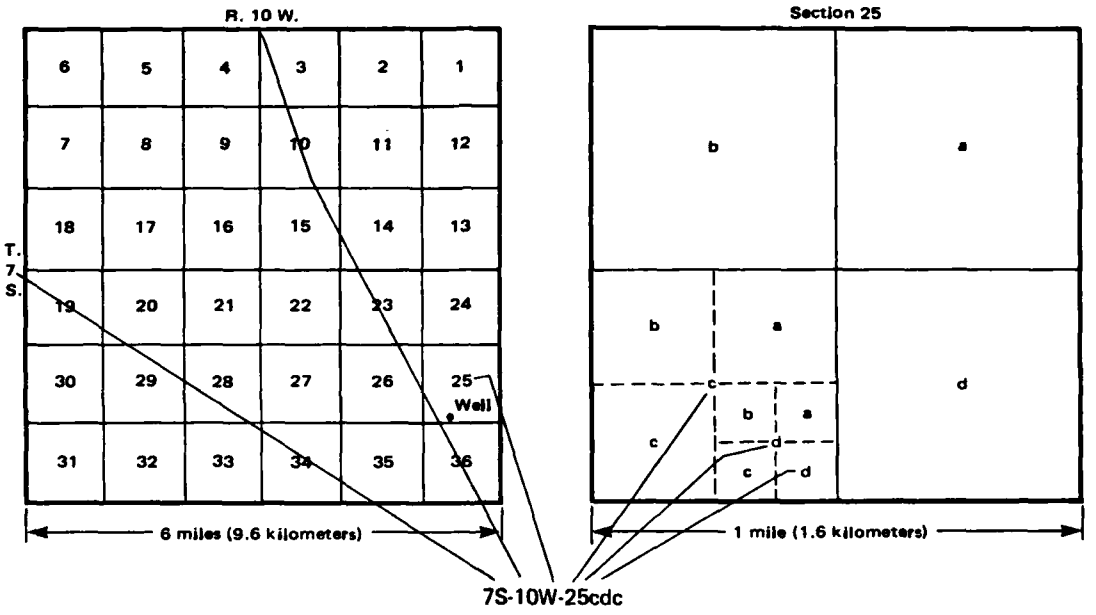
GROUND-WATER DATA
CAVE VALLEY, NEVADA

26 OCT 81

TABLE II-3-1

SECTIONS WITHIN A TOWNSHIP

TRACTS WITHIN A SECTION



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LAND SURVEY NEMBERING SYSTEM

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FIGURE II-3-1

4.0 SEISMIC REFRACTION DATA

Explanation: Each figure shows seismic wave travel times plotted versus surface distance between the energy source (shot) and the detector (geophone) for a single seismic line. Distances are measured along the line from geophone number 1 which is designated as zero distance. Distances to the right (on the paper) of geophone 1 are positive. The direction arrow gives the approximate direction along the geophone array from geophone 1 to geophone 24.

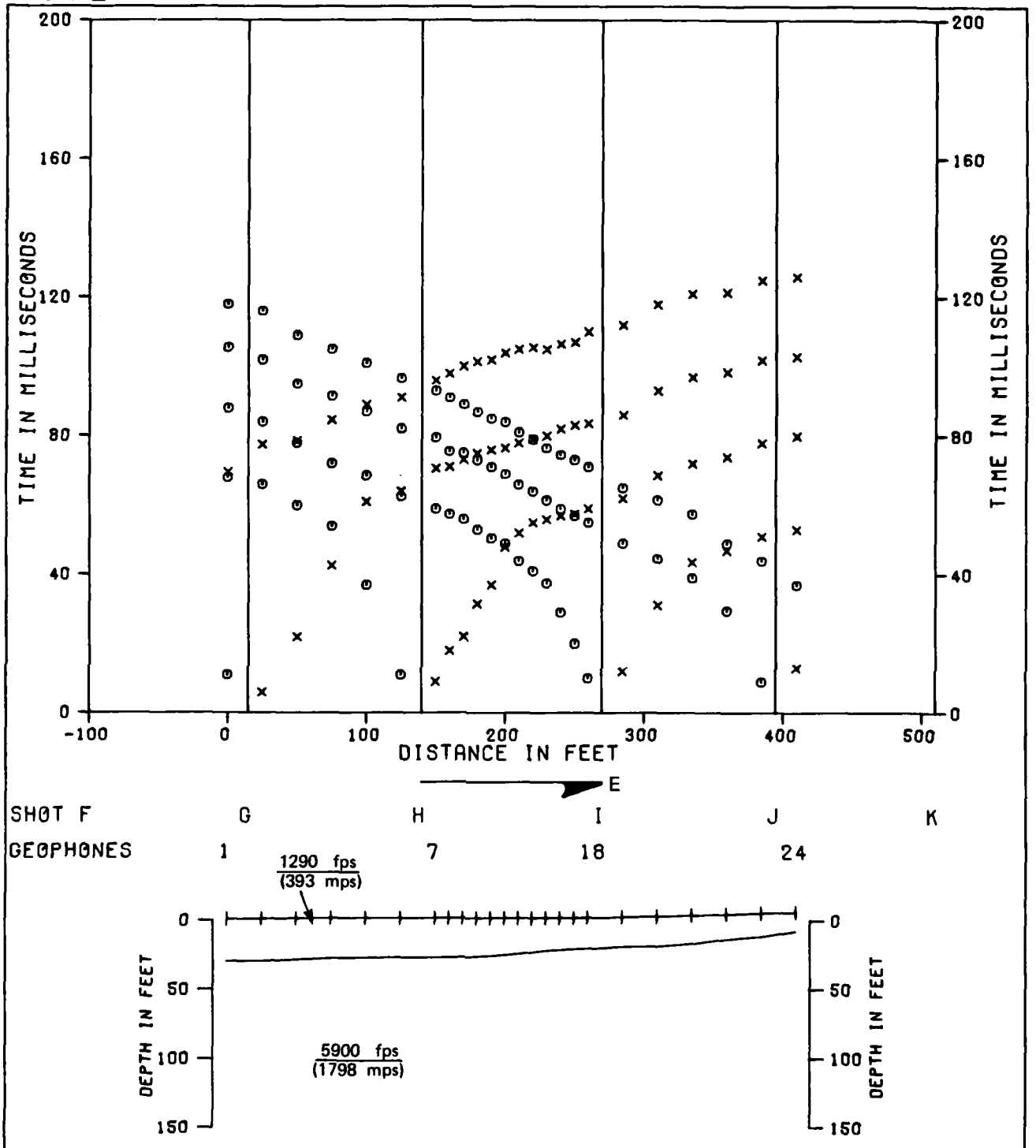
Travel Time Versus Distance Graph (Upper Half of Figure)

This is a travel time versus distance graph. The abscissa represents distance; the ordinate, time. The six vertical lines represent the locations of shots (designated as F, G, H, I, J, and K). The symbol, X, denotes travel times at geophones that were located to the right of a shot. The symbol, Θ, denotes travel times that were located to the left of shots.

Velocity Cross Section (Lower Half of Figure)

This is an interpreted velocity cross section beneath the seismic line. The top line represents the ground-surface profile. The short vertical lines crossing the top line mark the geophone positions. The depth scale is plotted relative to a point on the line which was arbitrarily chosen as "zero elevation" at the time the line was surveyed. The additional lines across the cross section represent the interpreted boundaries between layers of material with different compressional wave

velocities. These boundaries are commonly called "refractors". The velocity interpreted to be representative of each layer is shown.



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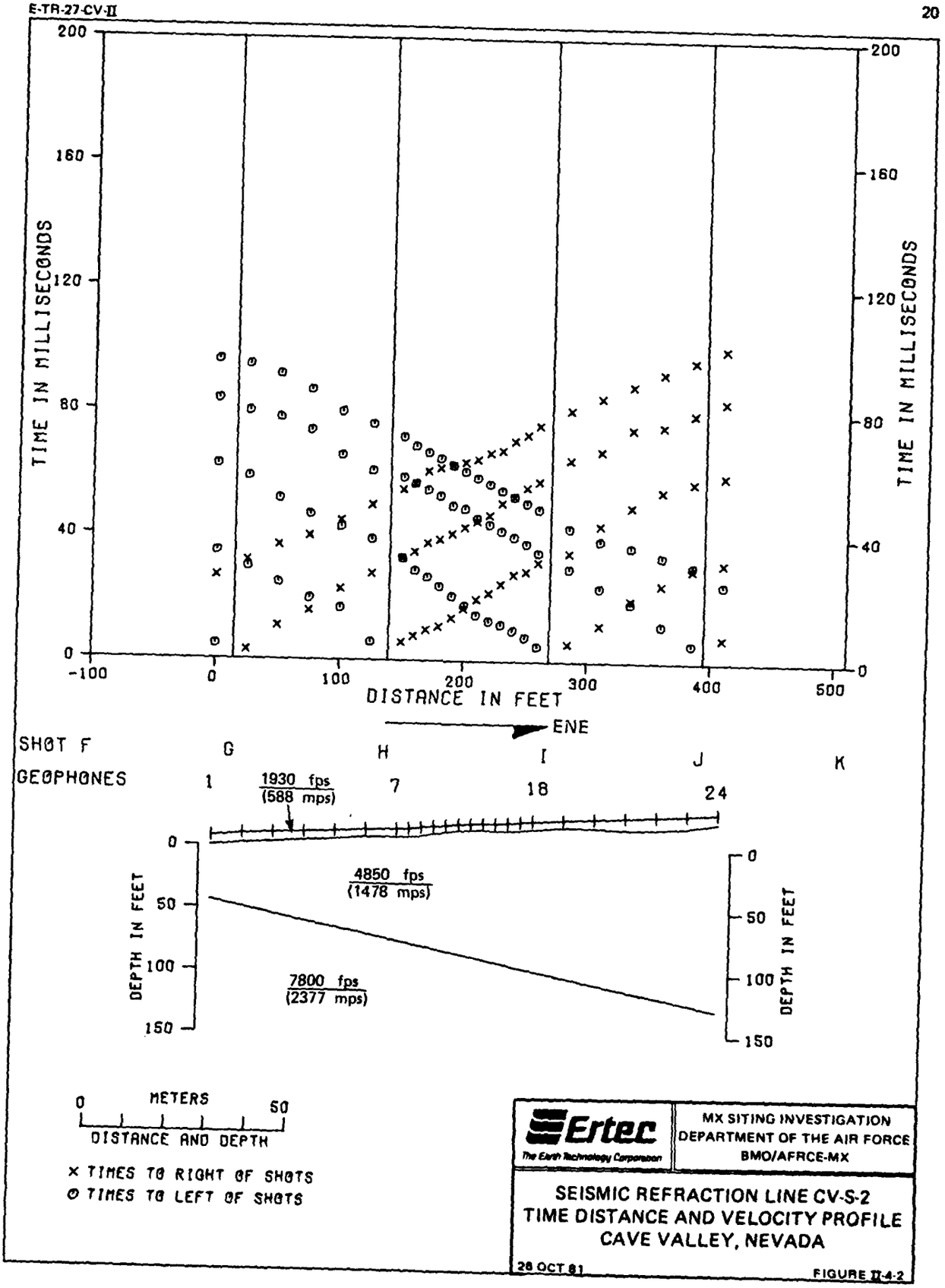
SEISMIC REFRACTION LINE CV-S-1
TIME DISTANCE AND VELOCITY PROFILE
CAVE VALLEY, NEVADA

26 OCT 81

FIGURE II-4-1



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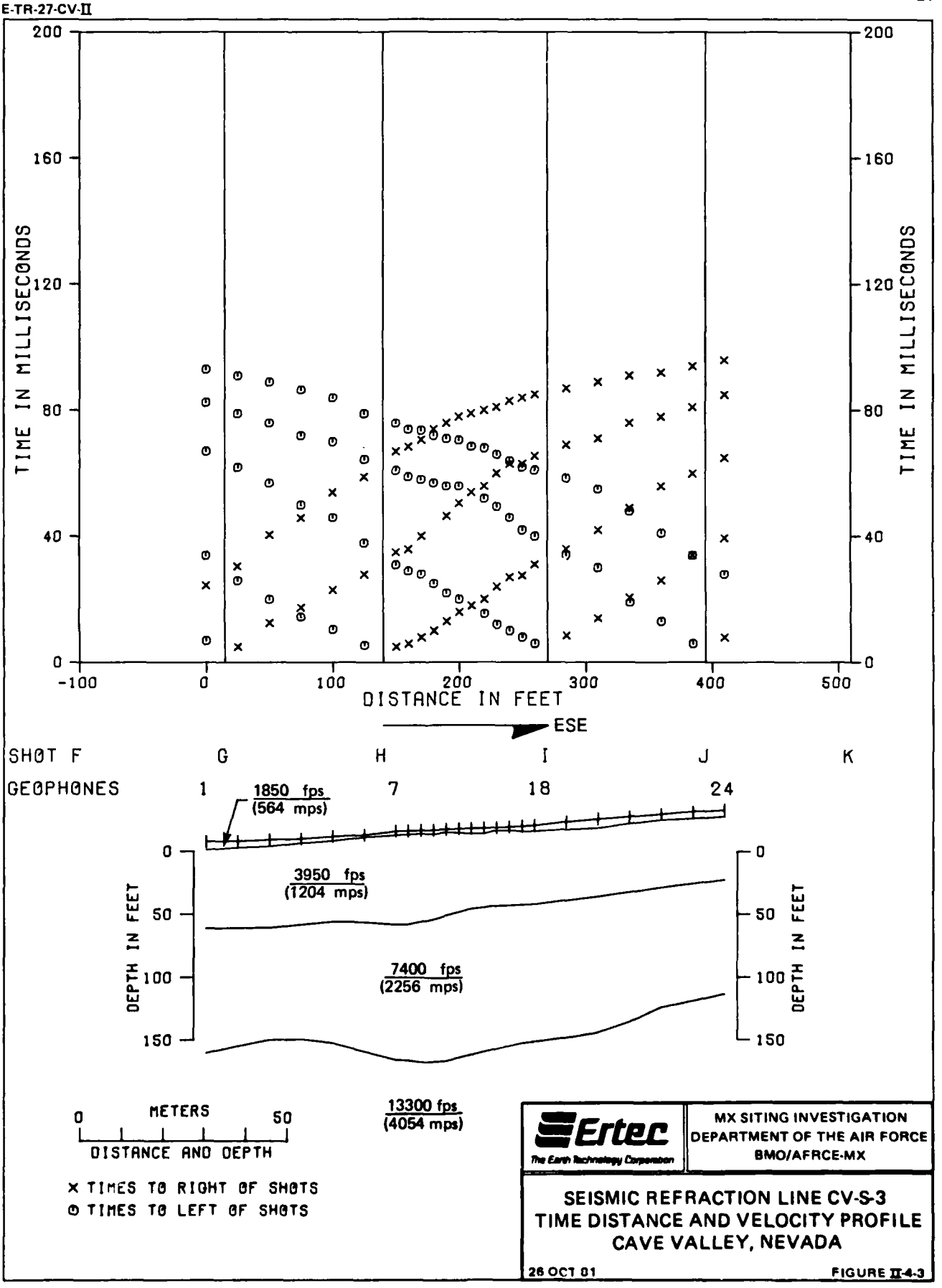
SEISMIC REFRACTION LINE CV-S-2
TIME DISTANCE AND VELOCITY PROFILE
CAVE VALLEY, NEVADA

28 OCT 81

FIGURE II-4-2



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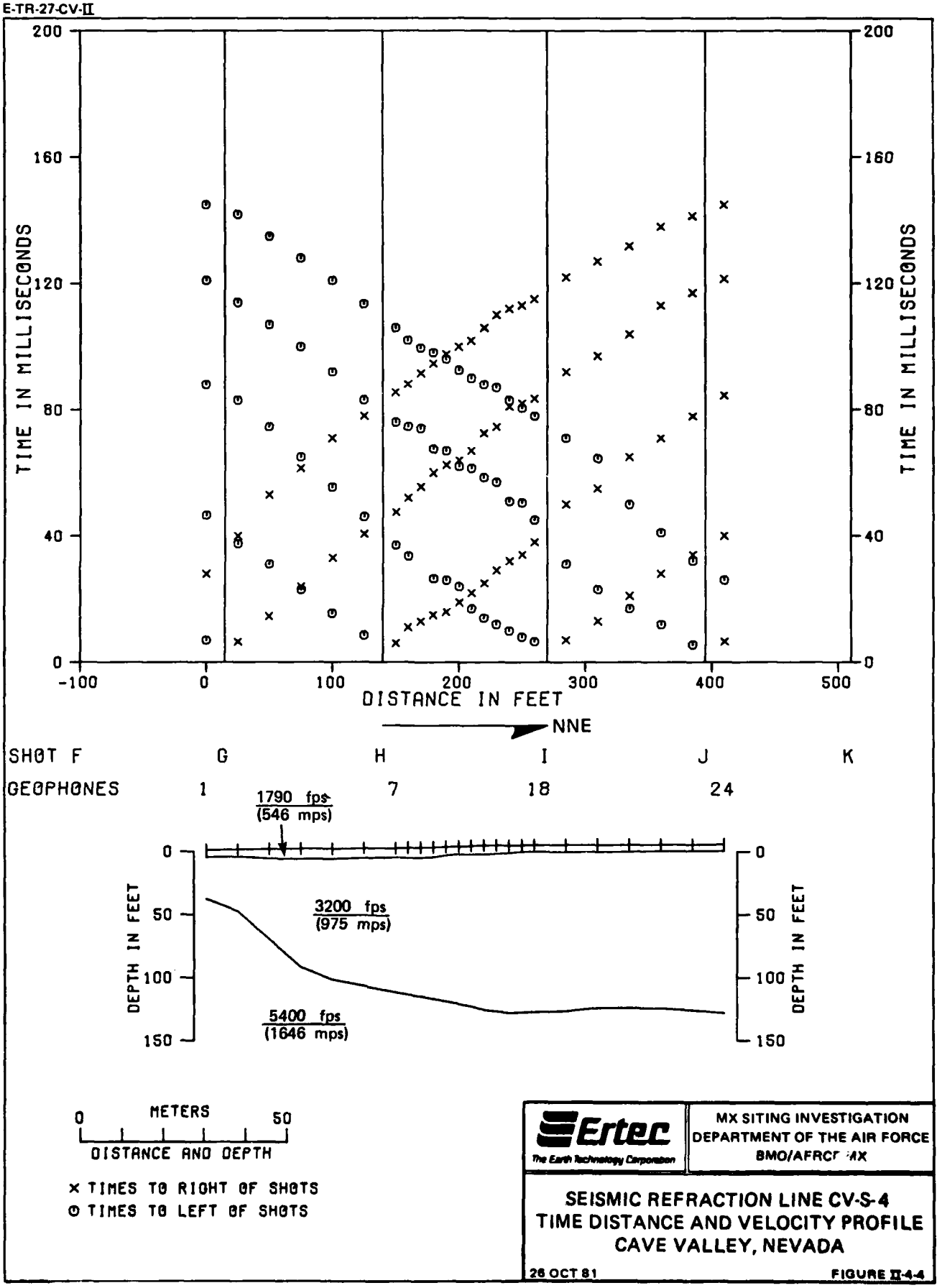
SEISMIC REFRACTION LINE CV-S-3
TIME DISTANCE AND VELOCITY PROFILE
CAVE VALLEY, NEVADA

26 OCT 01

FIGURE II-4-3

E-TR-27-CV-II



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SEISMIC REFRACTION LINE CV-S-4
TIME DISTANCE AND VELOCITY PROFILE
CAVE VALLEY, NEVADA

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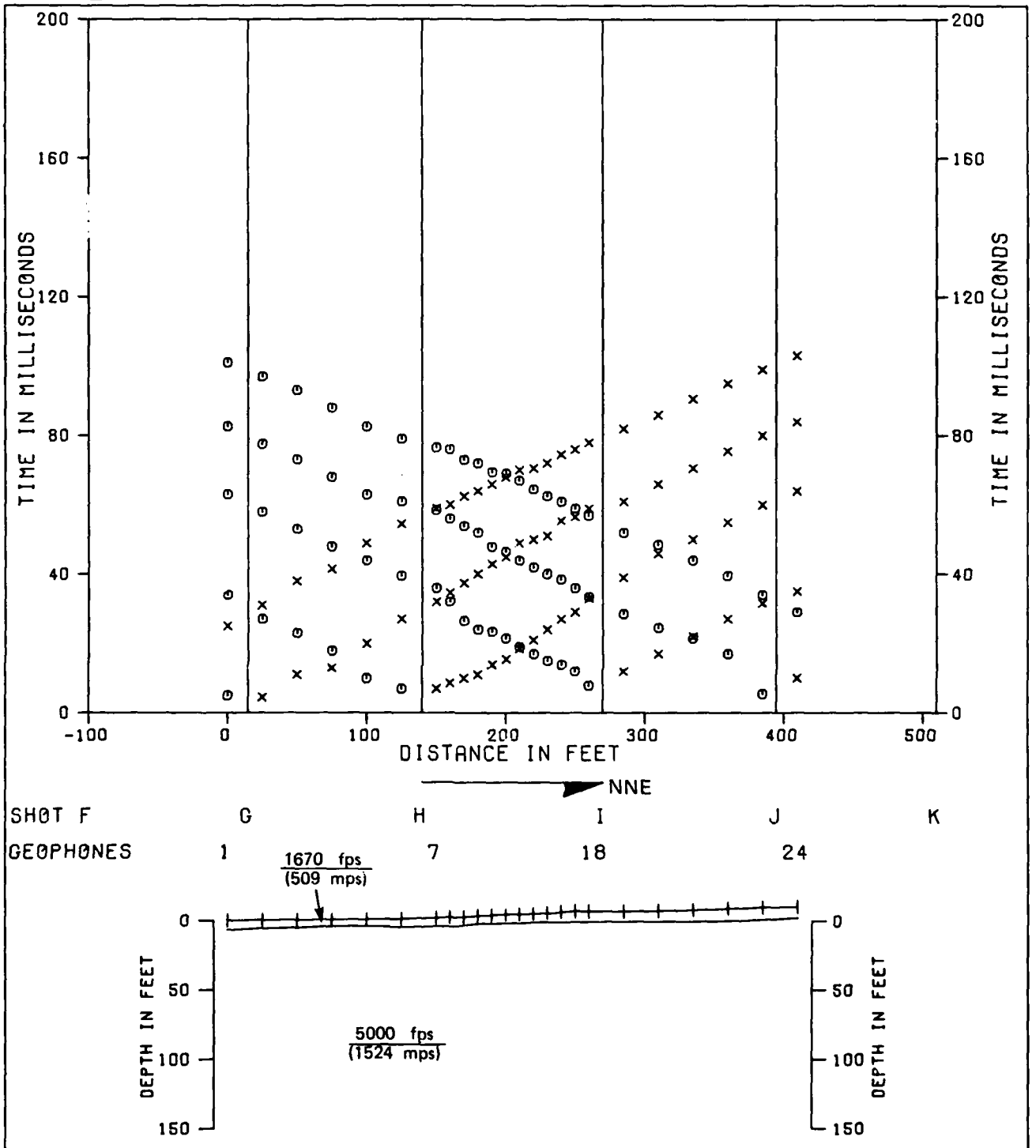
FIGURE II-4-4



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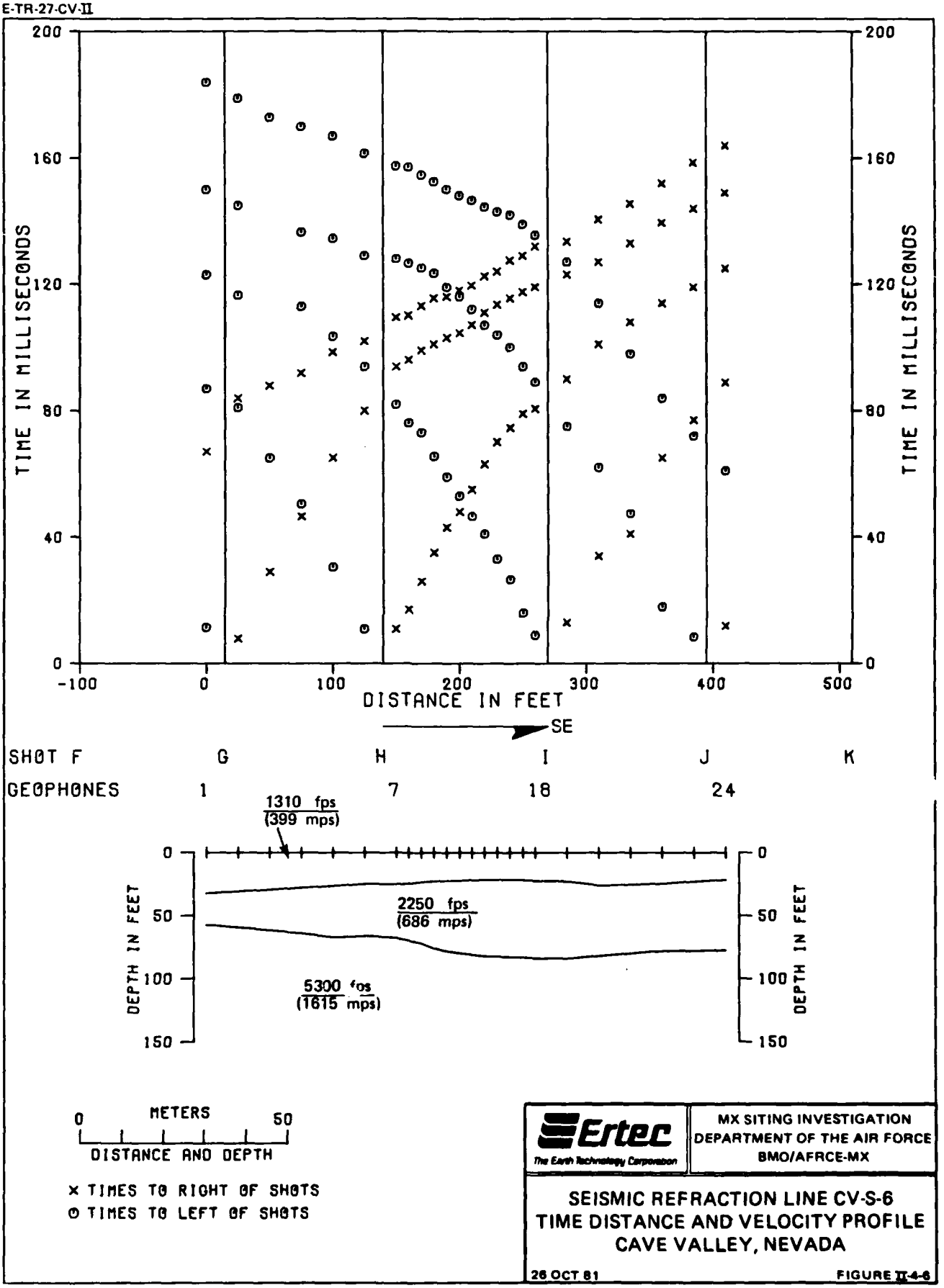
SEISMIC REFRACTION LINE CV-S-5
TIME DISTANCE AND VELOCITY PROFILE
CAVE VALLEY, NEVADA

26 OCT 81

FIGURE II-4-5



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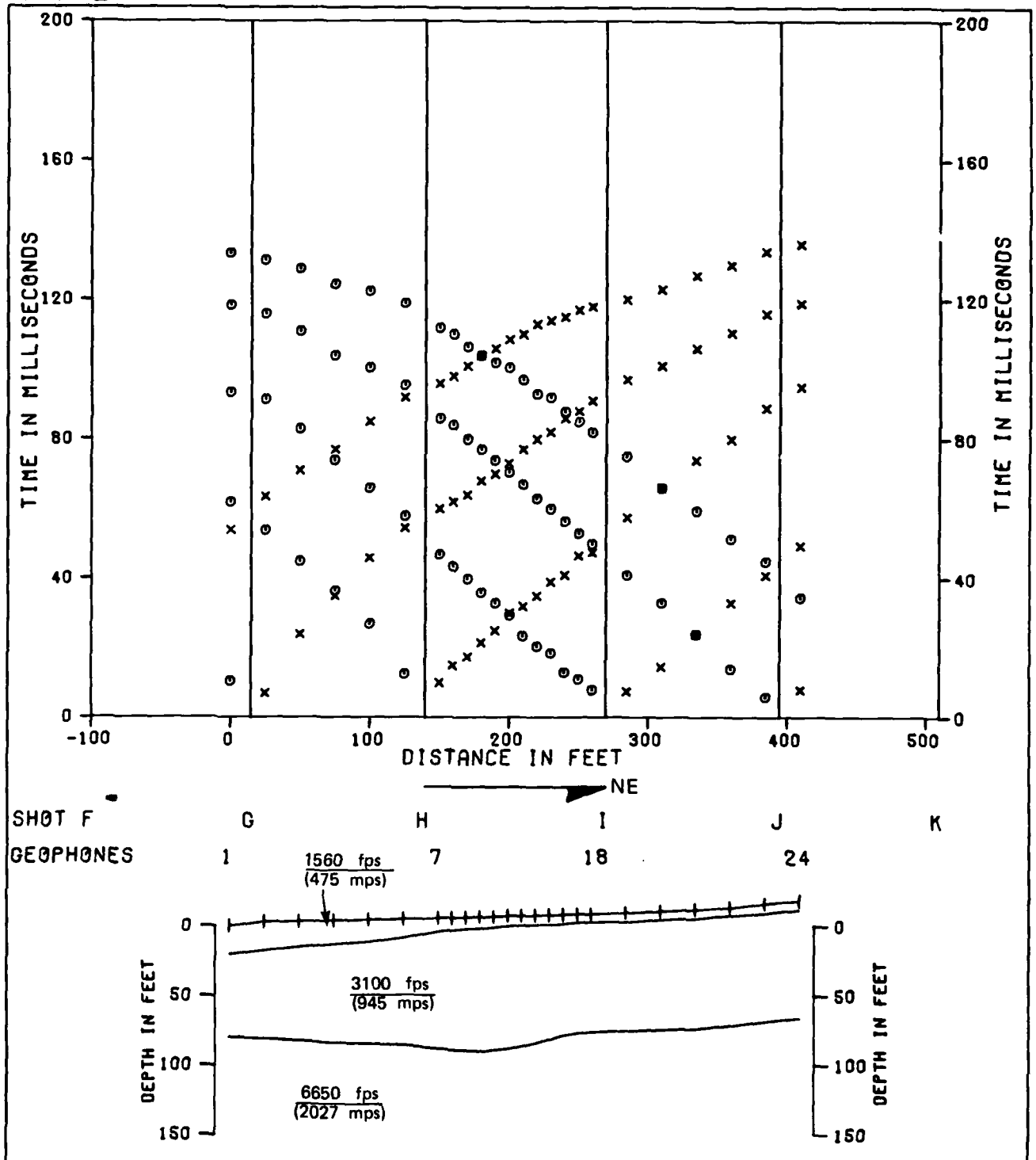
SEISMIC REFRACTION LINE CV-S-6
TIME DISTANCE AND VELOCITY PROFILE
CAVE VALLEY, NEVADA

26 OCT 81

FIGURE II-4-6



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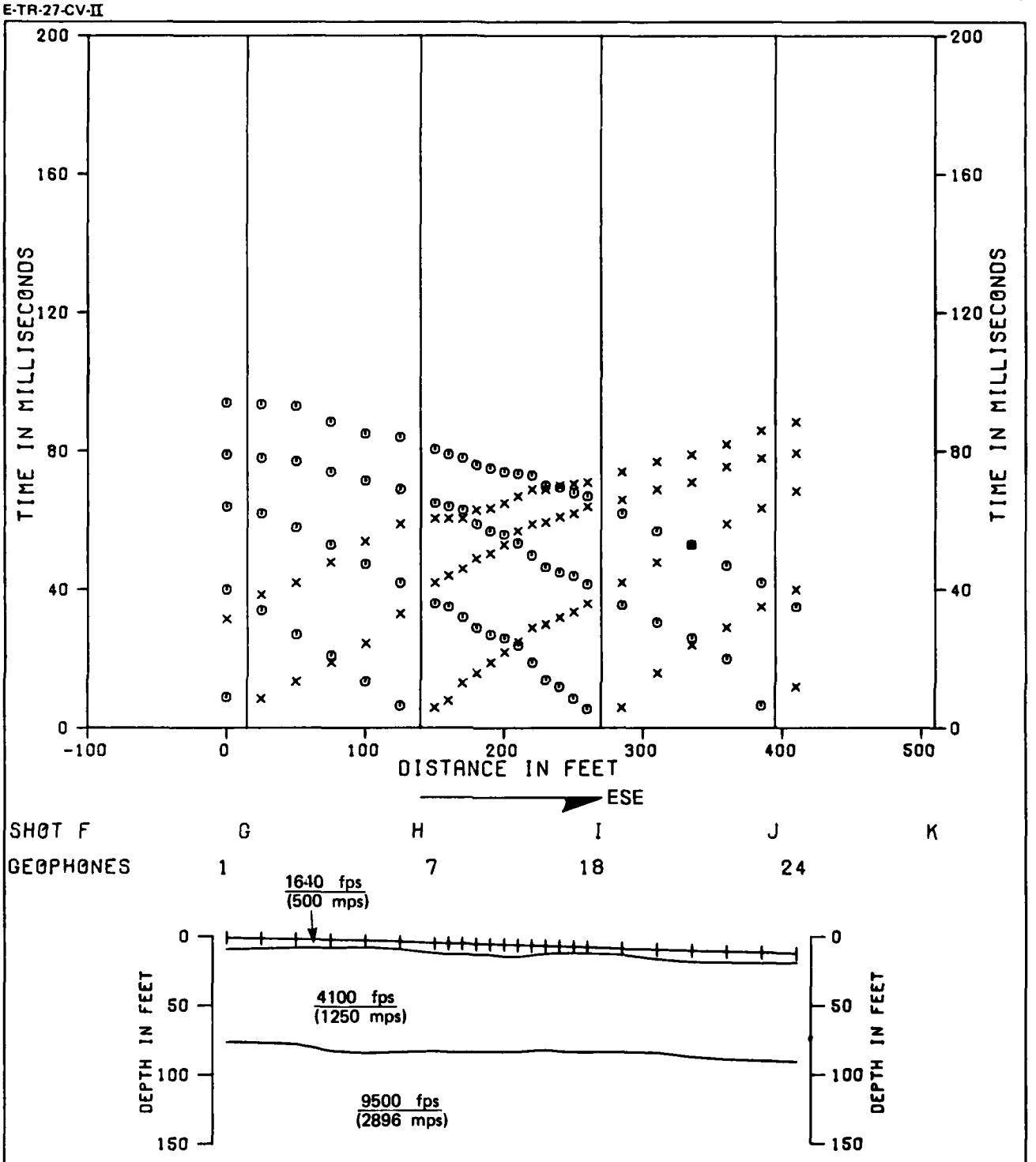
SEISMIC REFRACTION LINE CV-S-7
TIME DISTANCE AND VELOCITY PROFILE
CAVE VALLEY, NEVADA

26 OCT 81

FIGURE II-4-7



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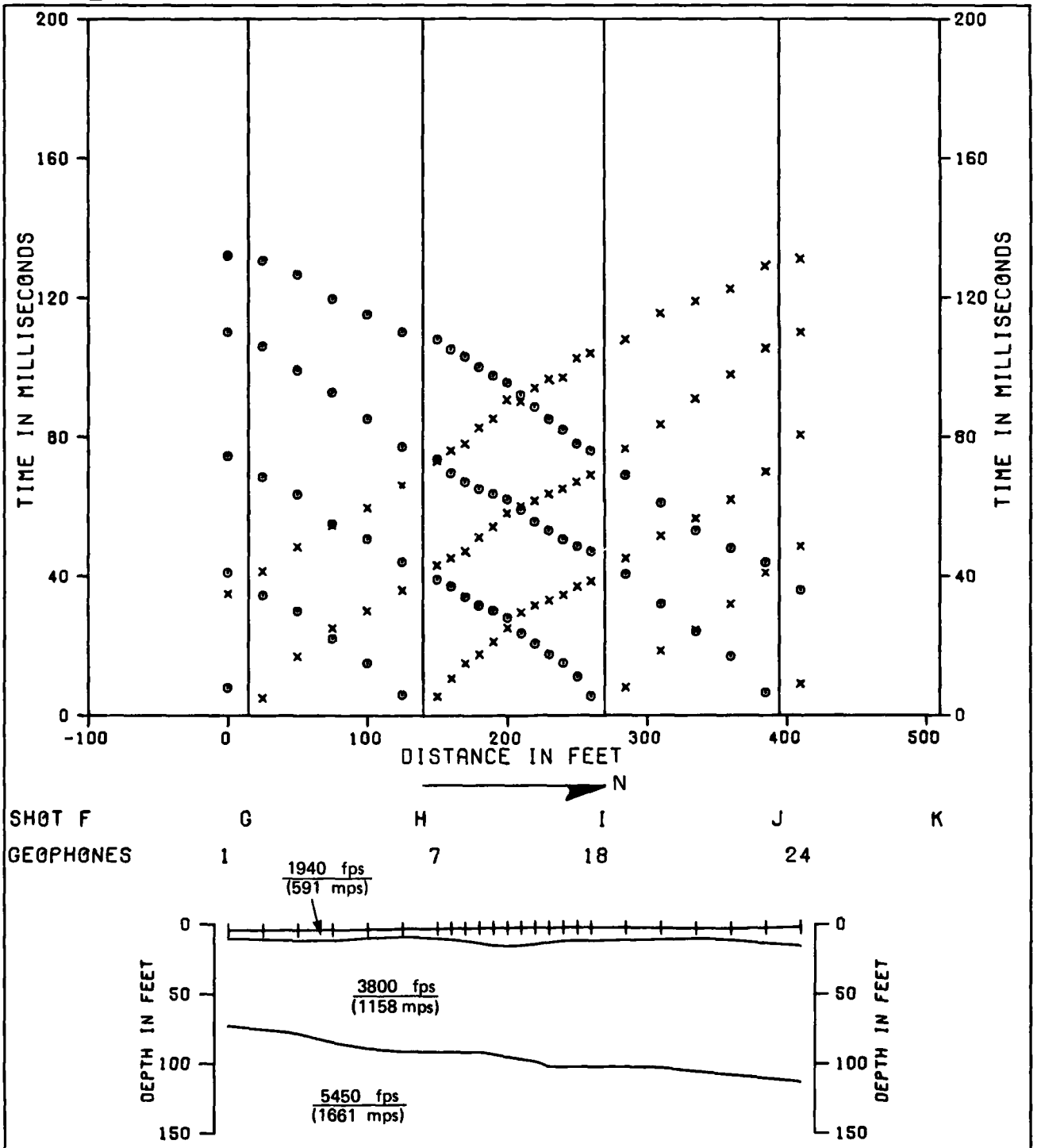
SEISMIC REFRACTION LINE CV-S-8
TIME DISTANCE AND VELOCITY PROFILE
CAVE VALLEY, NEVADA

26 OCT 81

FIGURE II-4-8



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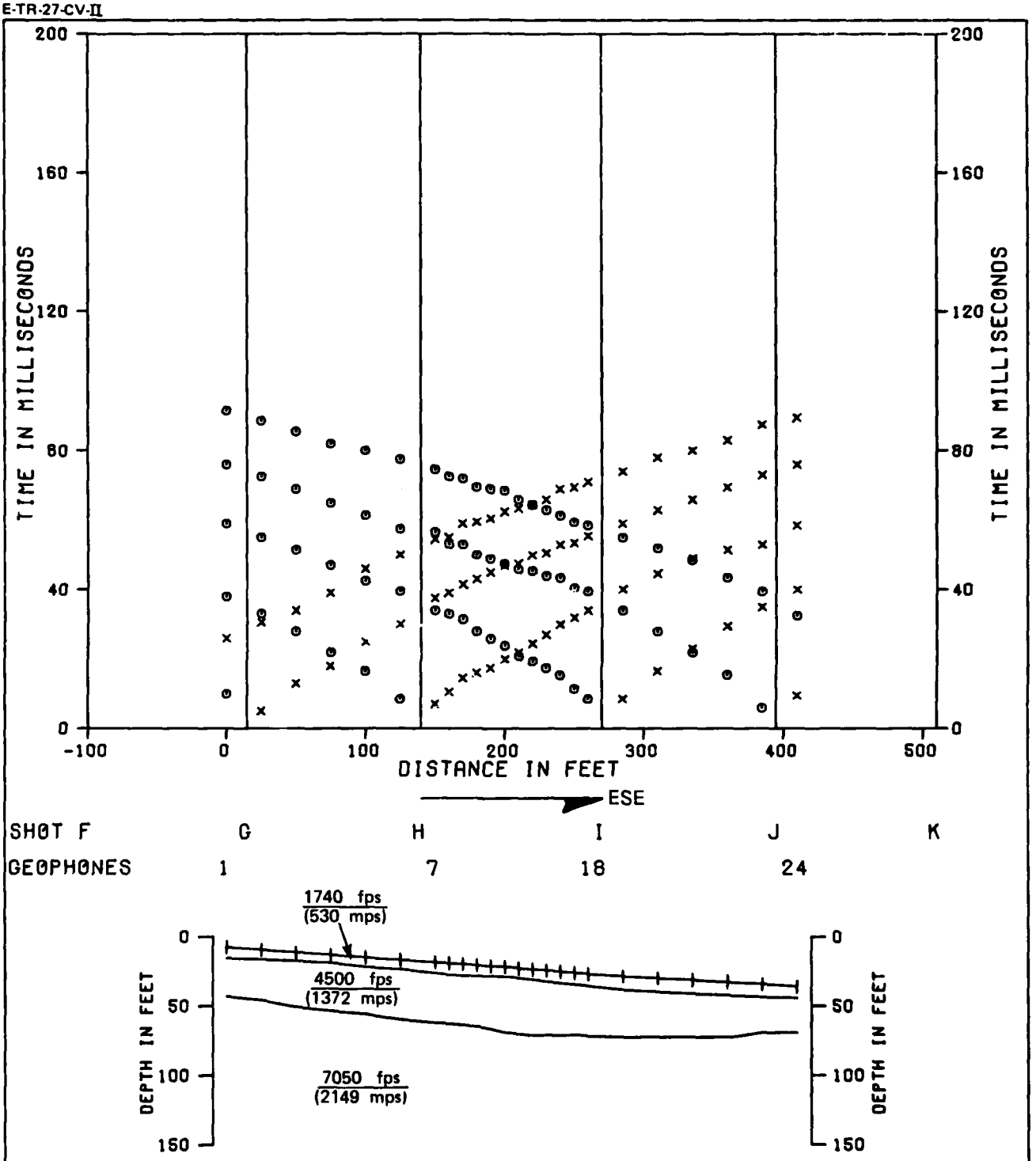
SEISMIC REFRACTION LINE CV-S-9
TIME DISTANCE AND VELOCITY PROFILE
CAVE VALLEY, NEVADA

26 OCT 81

FIGURE II-4-9



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SEISMIC REFRACTION LINE CV-S-10
TIME DISTANCE AND VELOCITY PROFILE
CAVE VALLEY, NEVADA

26 OCT 81

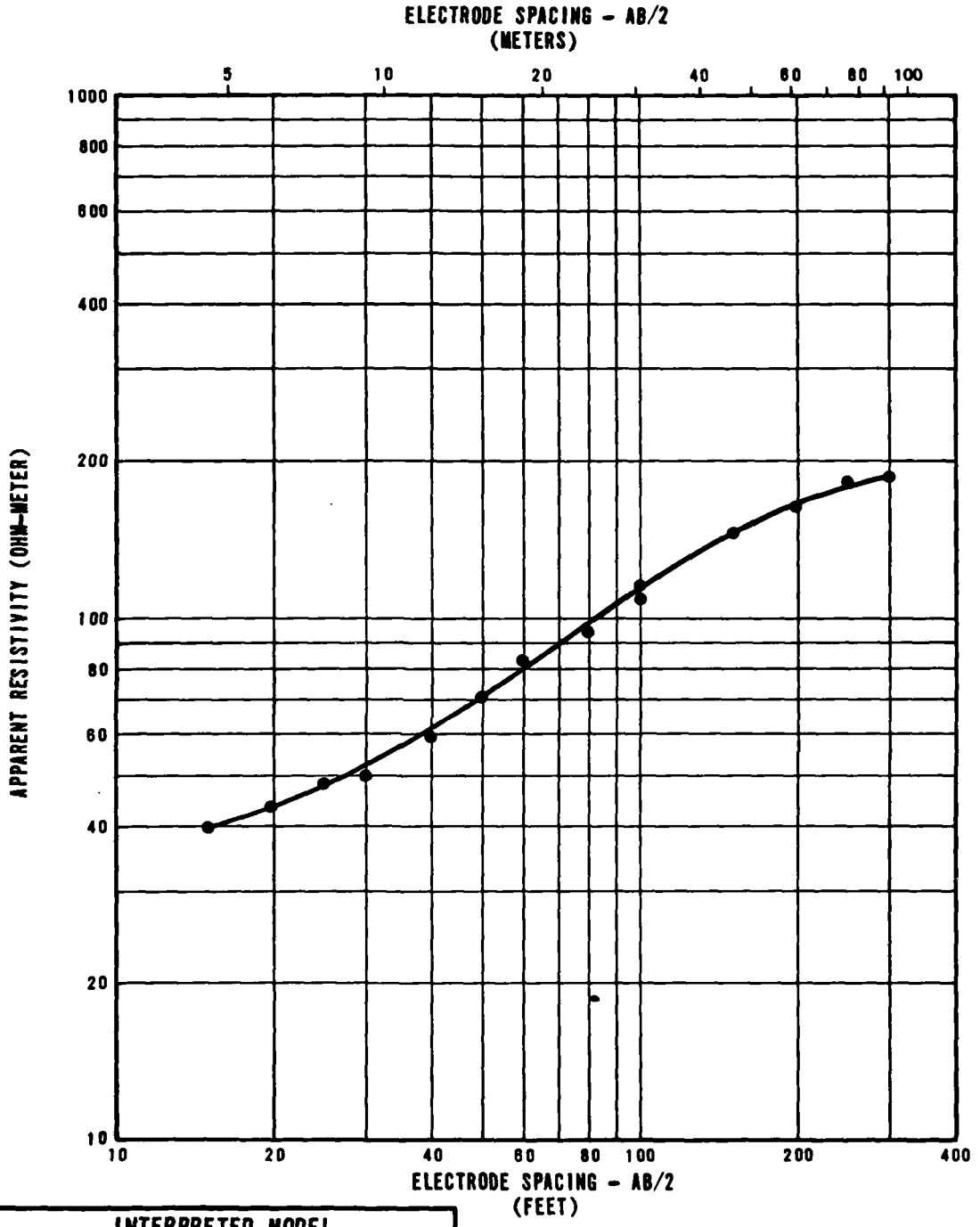
FIGURE II-4-10

5.0 ELECTRICAL RESISTIVITY DATA

Explanation: Each figure in this section presents the data obtained from a resistivity sounding and a tabulated model of resistivity layers that would produce a curve similar to the observed curve.

The upper portion of the figures is a graph in which measured apparent resistivity values in ohm-meters are plotted versus one-half the distance between the current electrodes.

The interpreted model tabulated at the bottom of the page shows a combination of true resistivity layers and thicknesses obtained by matching theoretical curves to the field curve.



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	35
18	5	180

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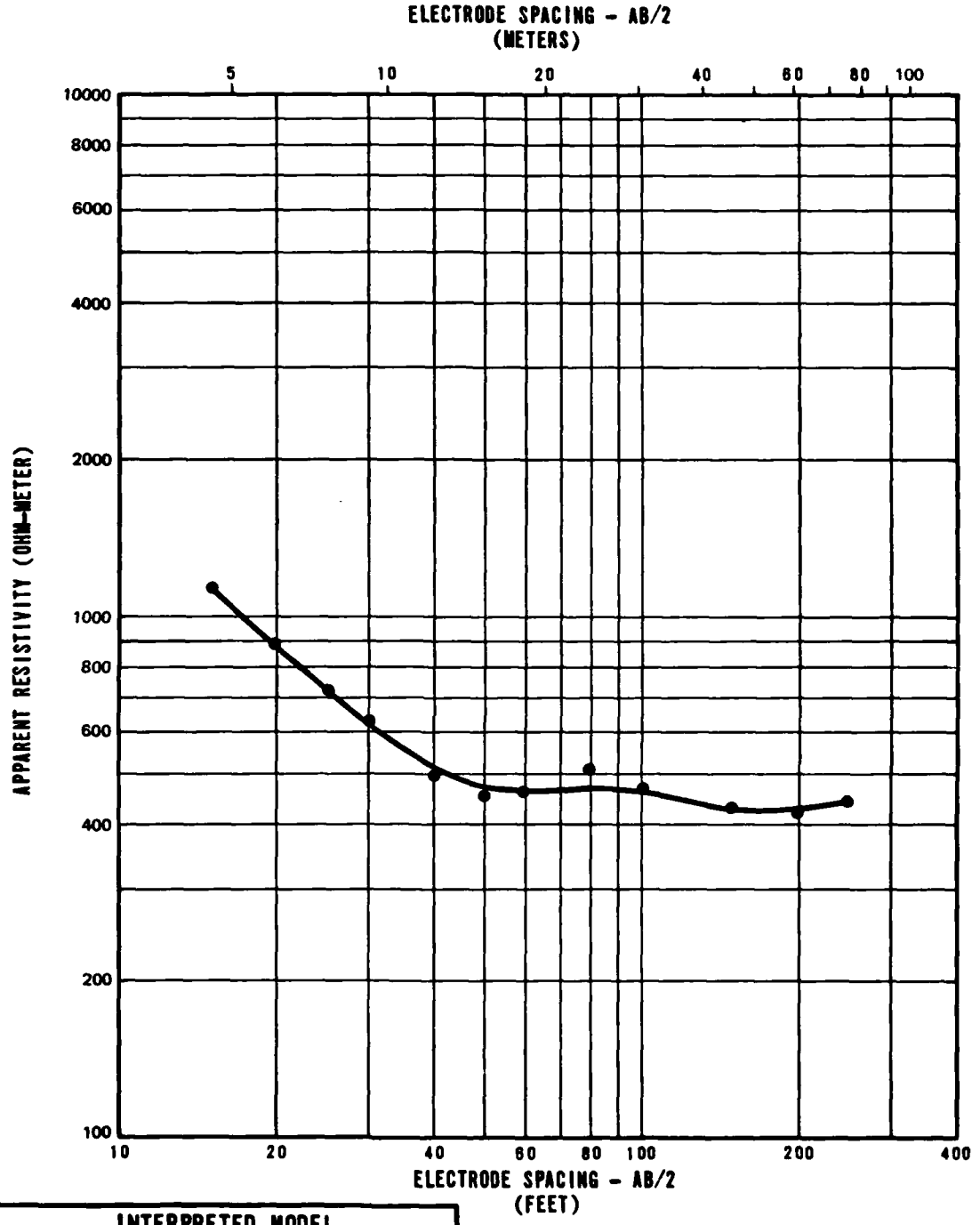
RESISTIVITY SOUNDING CV-R-1
SOUNDING CURVE AND INTERPRETATION
CAVE VALLEY, NEVADA

26 OCT 81

FIGURE II-5-1



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	1490
10	3	260
20	6	490
81	25	220

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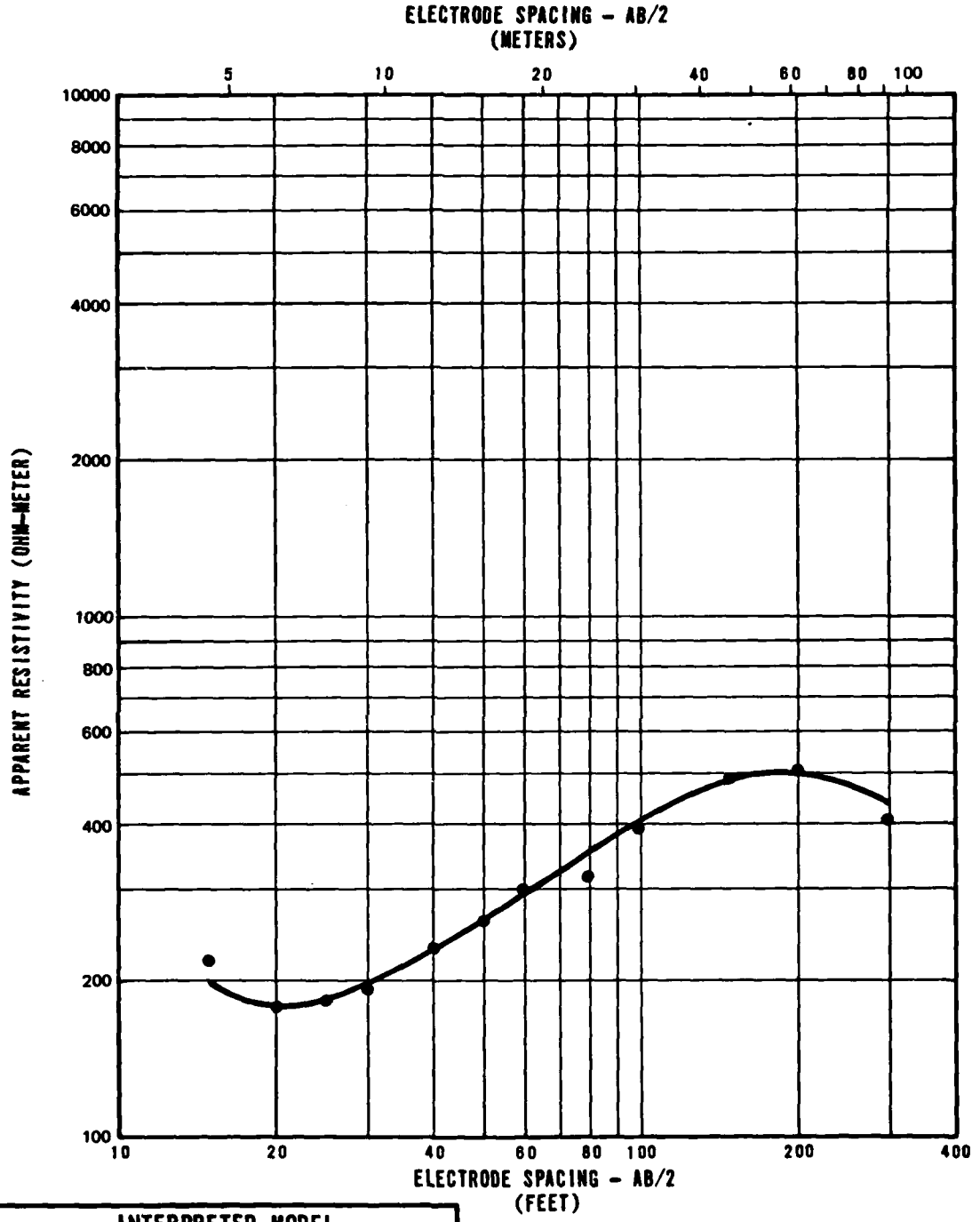
RESISTIVITY SOUNDING CV-R-2
SOUNDING CURVE AND INTERPRETATION
CAVE VALLEY, NEVADA

26 OCT 81

FIGURE II-5-2



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	280
5	2	140
24	7	1010
100	30	220

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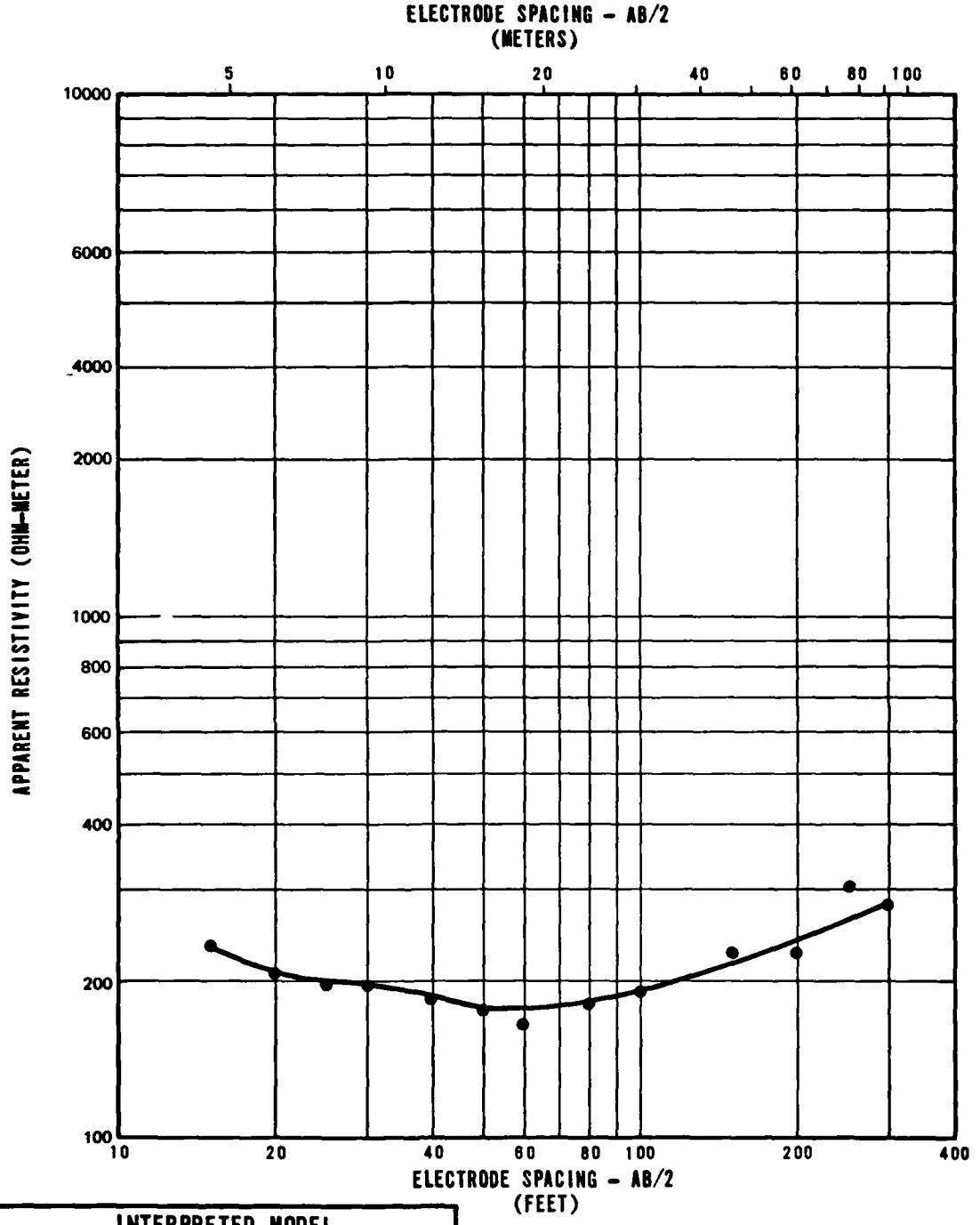
RESISTIVITY SOUNDING CV-R-3
SOUNDING CURVE AND INTERPRETATION
CAVE VALLEY, NEVADA

26 OCT 81

FIGURE II-5-3



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	270
7	2	170
84	26	370

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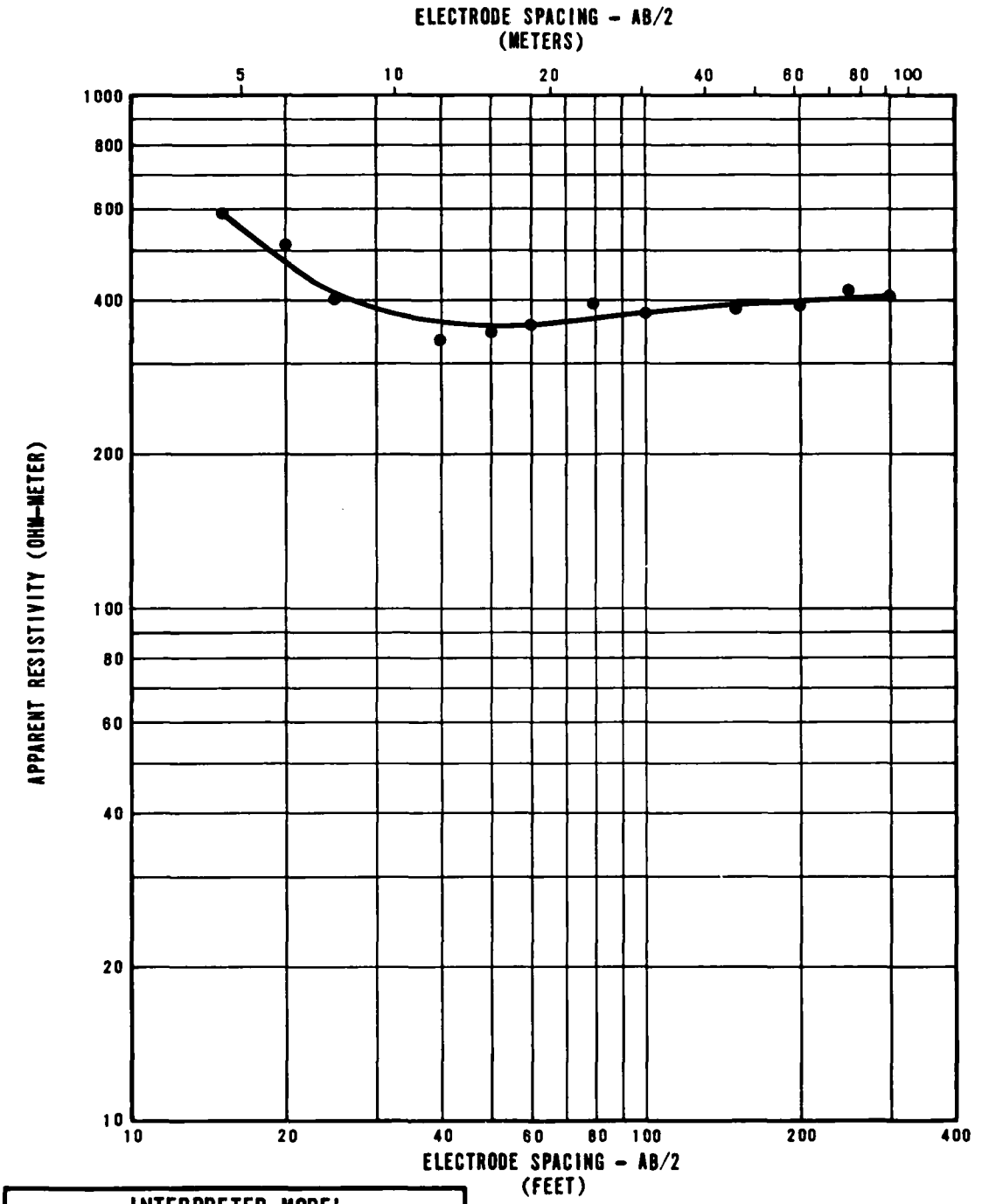
RESISTIVITY SOUNDING CV-R-4
SOUNDING CURVE AND INTERPRETATION
CAVE VALLEY, NEVADA

26 OCT 81

FIGURE II-6-4

AFV-15



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	770
5	2	360
29	9	430

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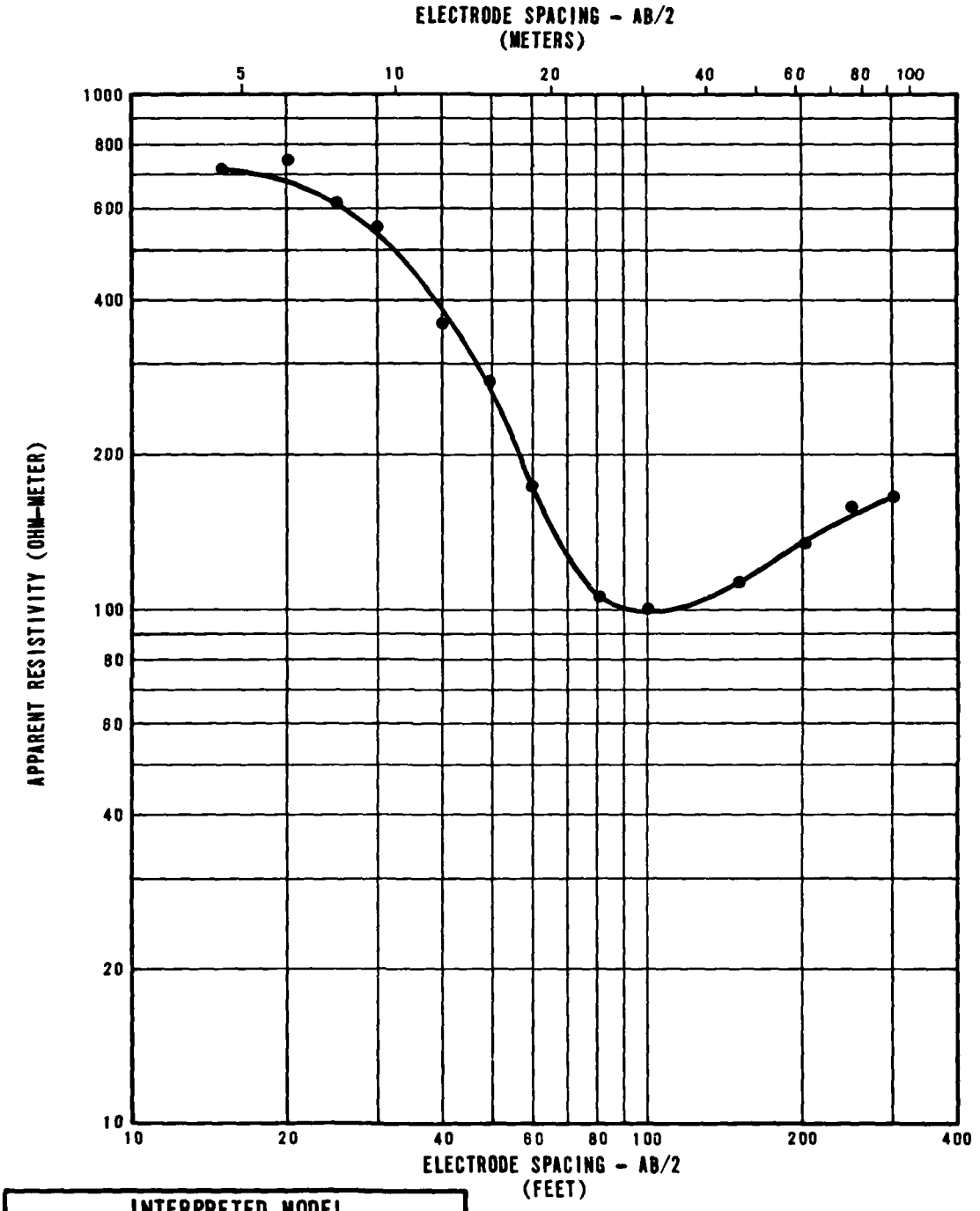
RESISTIVITY SOUNDING CV-R-5
SOUNDING CURVE AND INTERPRETATION
CAVE VALLEY, NEVADA

26 OCT 81

FIGURE II-5-5



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	660
15	5	240
27	8	11
36	11	250

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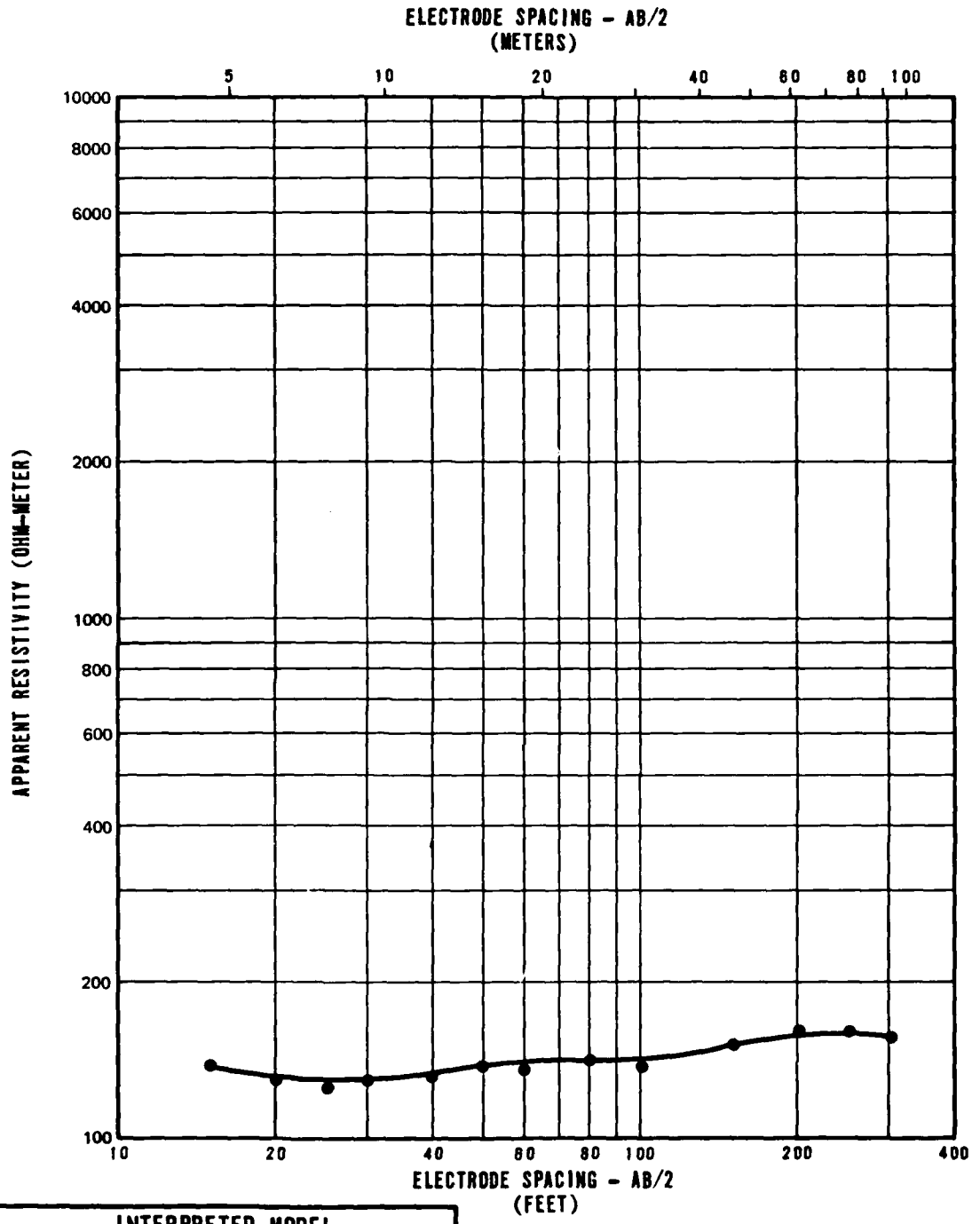
RESISTIVITY SOUNDING CV-R-6
SOUNDING CURVE AND INTERPRETATION
CAVE VALLEY, NEVADA

26 OCT 81

FIGURE II-5-6



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	150
9	3	110
24	7	160

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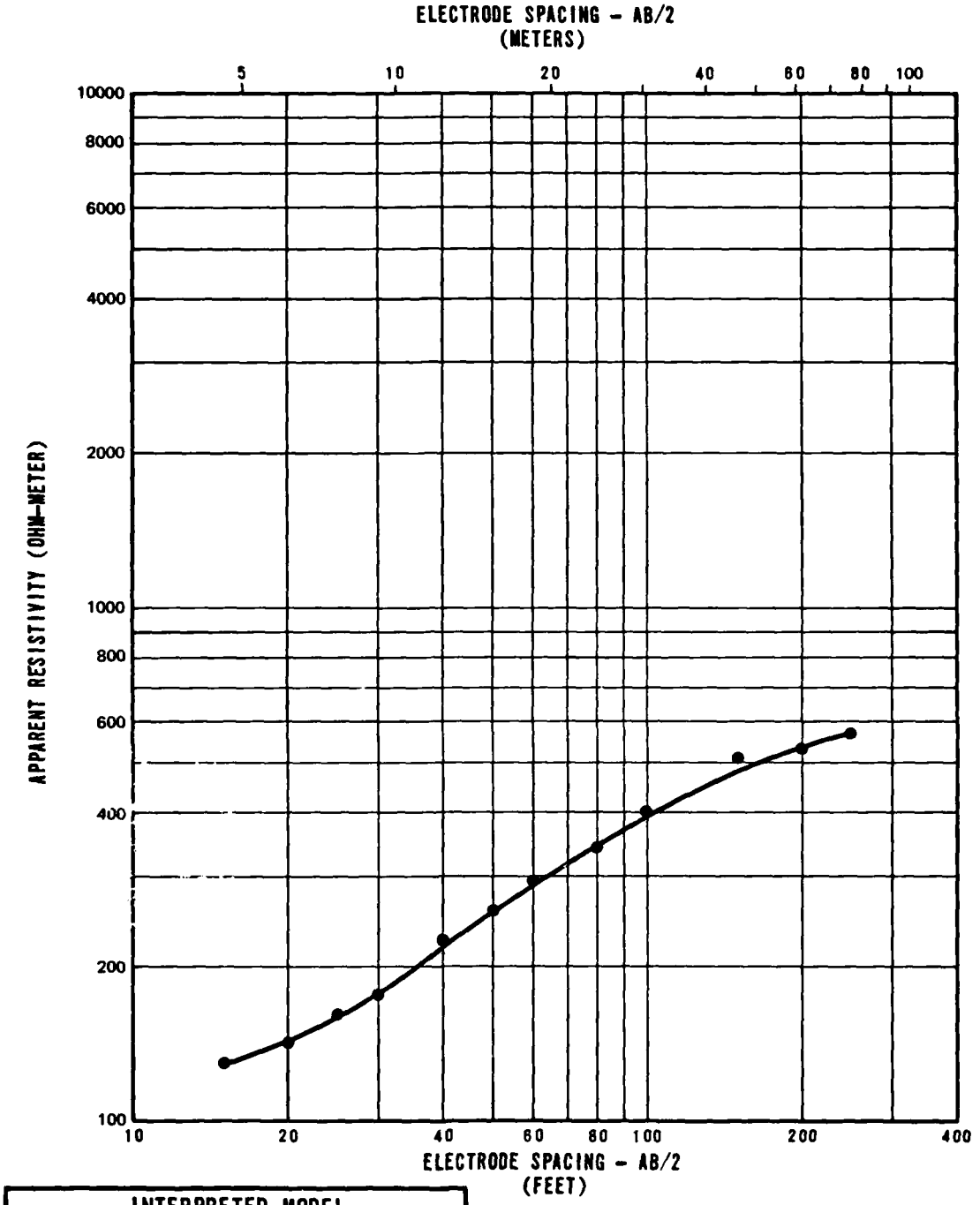
RESISITIVITY SOUNDING CV-R-7
SOUNDING CURVE AND INTERPRETATION
CAVE VALLEY, NEVADA

26 OCT 81

FIGURE II-5-7

AFV-15



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	120
18	5	760

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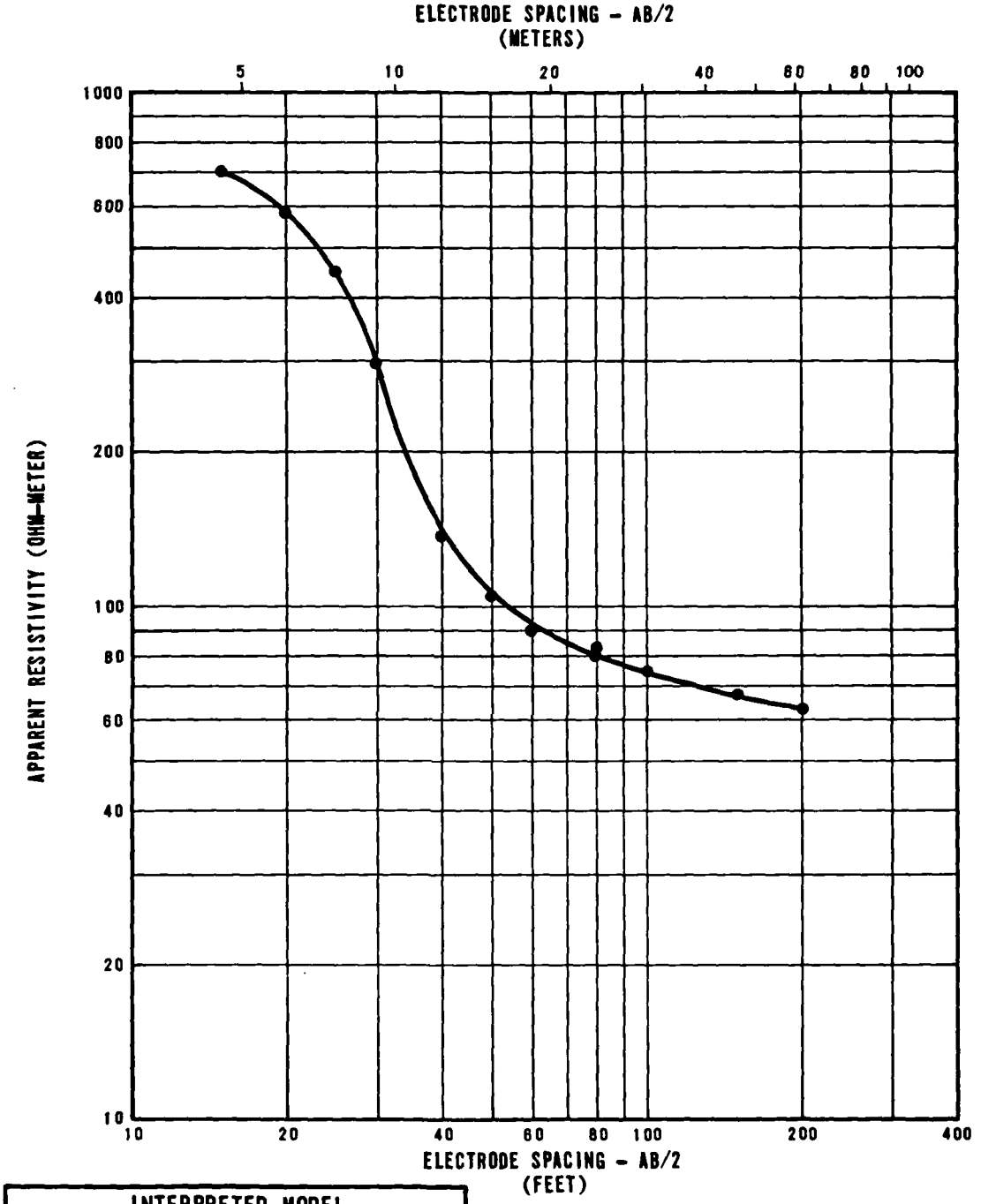
RESISTIVITY SOUNDING CV-R-8
SOUNDING CURVE AND INTERPRETATION
CAVE VALLEY, NEVADA

26 OCT 81

FIGURE II-5-8

AFV-15



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	850
13	4	90
70	21	50

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RESISTIVITY SOUNDING CV-R-9
SOUNDING CURVE AND INTERPRETATION
CAVE VALLEY, NEVADA

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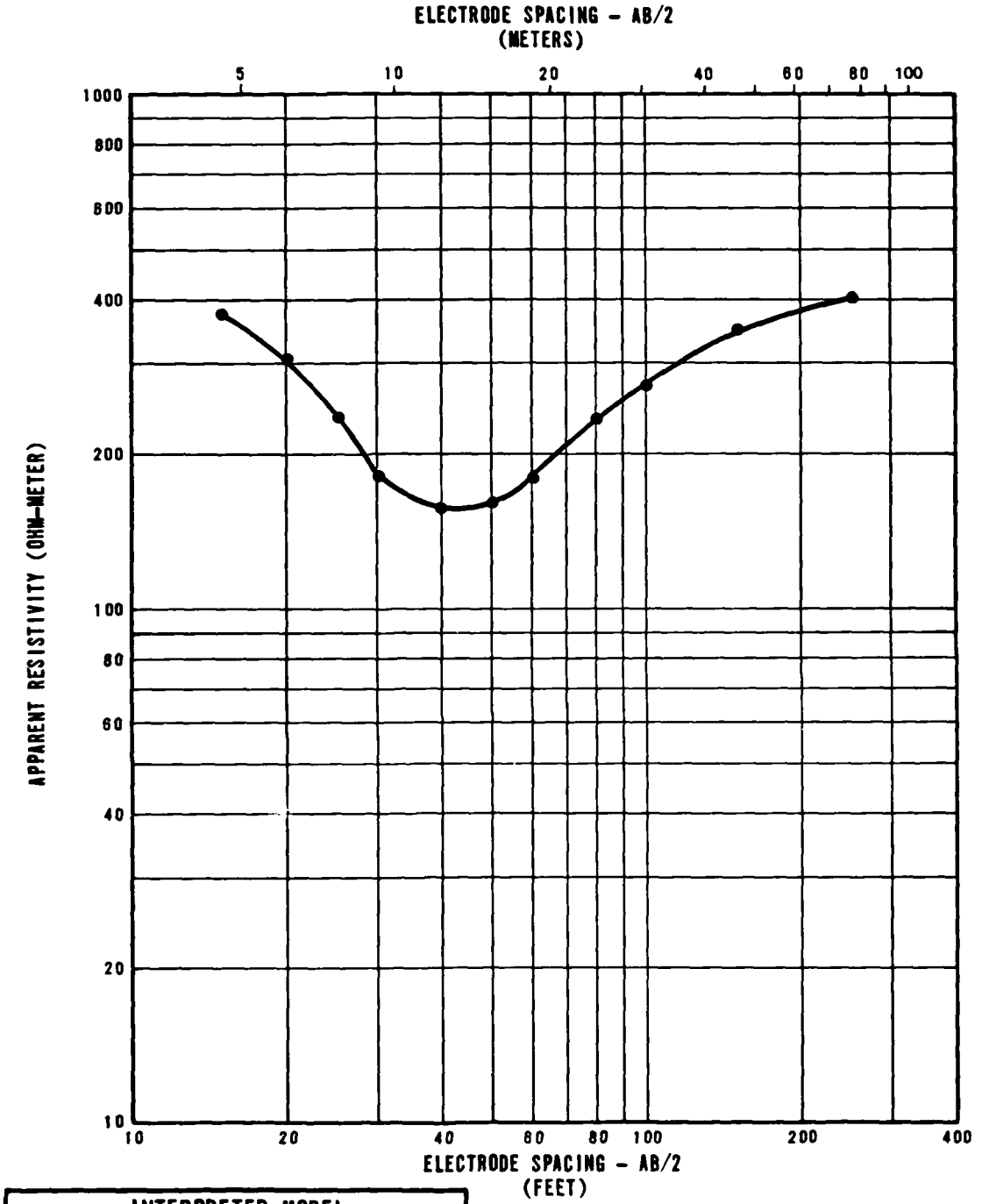
FIGURE II-5-9

AFV-15



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	520
10	3	110
16	5	35
21	7	510

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RESISTIVITY SOUNDING CV-R-10
SOUNDING CURVE AND INTERPRETATION
CAVE VALLEY, NEVADA

26 OCT 81

FIGURE II-5-10

AFV-15

6.0 BORING LOGS

Explanation: All data from borings, trenches, and test pits are presented on standard Ertec Western logs in Sections 6.0 and 7.0. Explanations of the column headings on the logs are as follows:

A. Designations - Borings, trenches, and test pits are identified as follows:

CV-B-1
CV - abbreviation for the valley (e.g., CV-Cave)
B - abbreviation for activity (e.g., B-boring, T-trench) P-test pit)
1 - number designation of activity

B. Sample Type - Different sampling techniques were used and the symbols are explained at the bottom of the boring logs. For details of the sampling techniques, see Section A5.0 of Appendix A in Volume I. Horizontal lines, to scale, indicate the depth where sampling was attempted.

C. Percent Recovery - The numbers shown represent the ratio (in percent) of the soil sample recovered in the sampler to the full penetration of the sampler.

D. N Value - Corresponds to standard penetration resistance, which is the number of blows required to drive a standard split-spoon sampler for the second and third of three 6-inch (15 cm) increments with a 140-pound (63.5 kg) hammer falling 30 inches (76 cm) (ASTM D 1586-67).

E. Depth - Corresponds to depth below ground surface in meters and feet.

F. Lithology - Graphic representation of the soil and rock types.

G. USCS - Unified Soil Classification System (see Table II-6-1 for complete details) symbols.

H. Soil Description - Except in cases where samples were classified based on laboratory test data, the descriptions are based on visual classification. The procedures outlined in ASTM D 2487-69, Classification of Soils for Engineering Purposes, and ASTMD 2488-69, Description of Soils (Visual-Manual Procedure), were followed. Solid lines across the column indicate a known change in strata at the depth shown.

Definitions of some of the terms and criteria to describe soils and conditions encountered during the exploration follow.

Gradation : A coarse-grained soil is well-graded if it has a wide range in grain size and substantial amounts of most intermediate particle sizes.

Poorly graded indicates that the soil consists predominantly of one size (uniformly graded) or has a wide range of sizes with some intermediate sizes obviously missing (gap-graded).

Moisture :

Dry (D)	- no feel of moisture - dry like powder
Slightly Moist (SM)	- much less than optimum moisture
Moist (M)	- near optimum moisture for soil - provides apparent cohesion
Very Moist (VM)	- much greater than optimum moisture
Wet (W)	- for soils below the water table or near saturation

Consistency: Consistency descriptions of coarse-grained soils (GW, GP, GM, GC, SW, SP, SM, SC) are as follows.

Field Identification Procedures (Excluding particles larger than 3 in. and basing fractions on estimated weights)		Group Symbols[a]	Typical Names	Information Required for Describing Soils	Laboratory Classification Criteria
Coarse-Grained soils More than half of material is larger than No. 200 sieve size[b]	Gravels More than half of coarse fraction is larger than No. 4 sieve size	Clean gravels (little or no fines)	Wide range in grain size and substantial amounts of all intermediate particle sizes	Give typical name; indicate approximate percentages of sand and gravel; maximum size; angularity, surface condition, and hardness of the coarse grains; local or geologic name and other pertinent descriptive information; and symbols in parentheses For undisturbed soils add information on stratification, degree of compactness, cementation, moisture conditions and drainage characteristics Example: *Silty sand, gravelly*; about 20% hard, angular gravel particles ½-in. maximum size; rounded and subangular sand grains coarse to fine, about 15% non-plastic fines, well compacted and moist in place; alluvial sand; *(SM)*	Determine percentages of gravel and sand from grain size curve Depending on percentage of fines (fraction smaller than No. 200 sieve size) coarse grained soils are classified as follows: Less than 5%: *GW, GP, SW, SP* More than 12%: *GM, GC, SM, SC* 5% to 12%: *Borderline* cases requiring use of dual symbols
			Predominantly one size or a range of sizes with some intermediate sizes missing		Not meeting all gradation requirements for *GW*
		Gravels with fines (appreciable amount of fines)	Poorly graded gravels, gravel-sand mixtures, little or no fines		
			Nonplastic fines (for identification procedures see *ML* below)		Atterberg limits below "A" line, or *PI* less than 4
			Plastic fines (for identification procedures, see *CL* below)		Atterberg limits above "A" line, with *PI* greater than 7
	Sands More than half of coarse fraction is smaller than No. 4 sieve size (For visual classification, the ¼ in. size may be used as equivalent to the No. 4 sieve size)	Clean sands (little or no fines)	Wide range in grain sizes and substantial amounts of all intermediate particle sizes		Atterberg limits above "A" line, or *PI* less than 4
			Predominantly one size or a range of sizes with some intermediate sizes missing		Not meeting all gradation requirements for *SW*
		Sands with fines (appreciable amount of fines)	Nonplastic fines (for identification procedures, see *ML* below)		Atterberg limits below "A" line or *PI* less than 5
			Plastic fines (for identification procedures, see *CL* below)		Atterberg limits above "A" line with *PI* greater than 7

Use grain size curve in identifying the fractions as given under field identification

Identification Procedures on Fraction Smaller than No. 40 Sieve Size (The No. 200 sieve size is about the smallest particle visible to the naked eye)				
Fine-grained soils More than half of material is smaller than No. 200 sieve size	Silts and clays Liquid limit less than 50	Dry Strength (crushing characteristics)	Dilatancy (reaction to shaking)	Toughness (consistency near plastic limit)	
		None to slight	Quick to slow	None	*ML*
		Medium to high	None to very slow	Medium	*CL*
		Slight to medium	Slow	Slight	*OL*
	Silts and clays Liquid limit greater than 50	Slight to medium	Slow to none	Slight to medium	*MH*
		High to very high	None	High	*CH*
		Medium to high	None to very slow	Slight to medium	*OH*
Highly Organic Soils		Readily identified by colour, odour, spongy feel and frequently by fibrous texture			*Pt*

From Wagner, 1957.

a *Boundary classifications.* Soils possessing characteristics of two groups are designated by combinations of group symbols. For example *GW-GC*, well graded gravel-sand mixture with clay binder.

b All sieve sizes on this chart are U.S. standard.

Field Identification Procedure for Fine Grained Soils or Fractions

These procedures are to be performed on the minus No. 40 sieve size particles, approximately ¼64 in. For field classification purposes, screening is not intended, simply remove by hand the coarse particles that interfere with the tests.

Dilatancy (Reaction to shaking):
After removing particles larger than No. 40 sieve size, prepare a pat of moist soil with a volume of about one-half cubic inch. Add enough water if necessary to make the soil soft but not sticky.
Place the pat in the open palm of one hand and shake horizontally, striking vigorously against the other hand several times. A positive reaction consists of the appearance of water on the surface of the pat which changes to a livery consistency and becomes glossy. When the sample is squeezed between the fingers, the water and gloss disappear from the surface, the pat stiffens and finally crumbles or cracks. The rapidity of appearance of water during shaking and of its disappearance during squeezing assist in identifying the character of the fines in a soil. Very fine clean sands give the quick-est and most distinct reaction whereas a plastic clay has no reaction. Inorganic silts, such as a typical rock flour, show a moderately quick reaction.

Dry Strength (Crushing characteristics):
After removing particles larger than No. 40 sieve size, mould a pat of soil to the consistency of putty, adding water if necessary. Allow the pat to dry completely by oven, sun or air drying, and then test its strength by breaking and crumbling between the fingers. This strength is a measure of the character and quantity of the colloidal fraction contained in the soil. The dry strength increases with increasing plasticity.
High dry strength is characteristic for clays of the *CH* group. A typical inorganic silt possesses only very slight dry strength. Silty fine sands and silts exhibit the next higher degree of dry strength. Sandy soils are identified by the feel when powdered and dried specimen. Fine sand feels gritty whereas a typical silt has the smooth feel of flour.

Toughness (Consistency near plastic limit):
After removing particles larger than the No. 40 sieve size, a specimen of soil about one-half inch cube in size, is moulded to the consistency of putty. If too dry, water must be added and if sticky, the specimen should be spread out in a thin layer and allowed to lose some moisture by evaporation. Then the specimen is rolled out by hand on a smooth surface or between the palms into a thread about one-eighth inch in diameter. The thread is then folded and re-rolled repeatedly. During this manipulation the moisture content is gradually reduced and the specimen stiffens, finally loses its plasticity, and crumbles when the plastic limit is reached.
After the thread crumbles, the pieces should be lumped together and a slight kneading action continued until the lump crumbles.
The tougher the thread near the plastic limit and the stiffer the lump when it finally crumbles, the more potent is the colloidal clay fraction in the soil. Weakness of the thread *at the plastic limit* and quick loss of coherence of the lump below the plastic limit indicate either inorganic clay of low plasticity, or materials such as kaolin-type clays and organic clays which occur below the A-line.
Highly organic clays have a very weak and spongy feel at the plastic limit.

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UNIFIED SOIL CLASSIFICATION SYSTEM

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TABLE II-6-1

Consistency	N Value (ASTM D 1586-67)
Very Loose	0 - 4
Loose	4 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	>50

Consistency descriptions of fine-grained soils (ML, CL, MH, CH,) are as follows:

Consistency	Shear Strength (ksf)	Shear Strength (kN/m^2)	Field Guide
Very Soft	0.25	12	Sample with height equal to twice the diameter, sags under own weight
Soft	0.25-0.50	12 - 24	Can be squeezed between thumb and forefinger
Firm	0.50-1.00	24-48	Can be molded easily with fingers
Stiff	1.00-2.00	48-96	Can be imprinted with slight pressure from fingers
Very Stiff	2.00-4.00	96-192	Can be imprinted with considerable pressure from fingers
Hard	over 4.00	over 192	Cannot be imprinted by fingers

Grain Shape: Angular - particles have sharp edges and relatively plane sides with unpolished surfaces.

Subangular - particles are similar to angular but have somewhat rounded edges.

Subrounded - particles exhibit nearly plane sides but have well-rounded corners and edges.

Rounded - particles have smoothly curved sides and no edges.

Calcareous : Containing calcium carbonate; presence of calcium carbonate is commonly identified on the basis of reaction with dilute hydrochloric acid.

Caliche : Soils cemented by calcium carbonate and/or other soluble minerals by upward-moving solutions.

Degree of Cementation: (Stages of development of caliche profile)

Stage	Gravelly Soils	Nongravelly Soils
I	Thin, discontinuous pebble coatings	Few filaments or faint coatings
II	Continuous pebble coatings, some interpebble fillings	Few to abundant nodules, flakes, filaments
III	Many interpebble fillings	Many nodules and internodular fillings
IV	Laminar horizon overlying plugged horizon	Increasing carbonate impregnation

Secondary Material : Example - Sand with trace to some silt
Trace - 5-12% (by dry weight)
Little - 13-20% (by dry weight)
Some - >20% (by dry weight)

Plasticity : Plasticity index is the range of water content, expressed as a percentage of the weight

of the oven-dried soil, through which the soil is plastic. It is defined as the liquid limit minus the plastic limit. Descriptive ranges used on the logs include:

Nonplastic	(PI, 0 - 4)
Slightly Plastic	(PI, 4 - 15)
Medium Plastic	(PI, 15 - 30)
Highly Plastic	(PI, >30)

Cobbles and Boulders : A cobble is a rock fragment, usually rounded by weathering or abrasion, with an average diameter ranging between 3 and 12 inches (76 and 305 mm).

A boulder is a rock fragment, usually rounded by weathering or abrasion, with an average diameter of 12 inches (305 mm) or more.

I. Remarks - This column was provided on boring and trench logs for comments regarding drilling difficulty, number and size of cobbles or boulders encountered, loss of drilling fluid in the boring, trench wall stability, and other conditions encountered during drilling and excavations.

J. Dry Density and Moisture Content - The boring logs include a graphical display of laboratory test results for dry density (ASTM D 2937-71) in pounds per cubic foot and kilograms per cubic meter and moisture content (ASTM D 2216-71) in percent from representative samples taken during drilling. The symbols are explained at the bottom of the boring logs.

K. Sieve Analysis - The numbers represent the percentage by dry weight (ASTM D 422-63) of each of the following soil components:

GR - Gravel, rock particles that will pass 3-inch (76 mm) sieve and are retained on the No. 4 (4.75 mm) sieve.

SA - Sand, soil particles passing the No. 4 sieve and retained on the No. 200 (0.075 mm) sieve.

FI - Fines, silt or clay, soil particles passing the No. 200 sieve.

L. Atterberg Limits (LL and PI) -

LL - Liquid Limit, the water content corresponding to the arbitrary limit between the liquid and plastic states of consistency of a soil (ASTM D 423-66).

PL - Plastic Limit, the water content corresponding to an arbitrary limit between the plastic and the semisolid state of consistency of a soil (ASTM D 424-59).

PI - Plasticity Index, numerical difference between the liquid limit (LL) and the plastic limit (PL) indicating the range of moisture content within which a soil-water mixture is plastic.

NP - Nonplastic.

M. Miscellaneous Information -

Elevations - indicated elevations on the logs are estimated from topographic maps of the study area with an accuracy of half the contour interval.

Surficial Geologic Unit - indicates the surficial geologic unit in which the activity is located.

Date Drilled - indicates the period from beginning to completion of the activity.

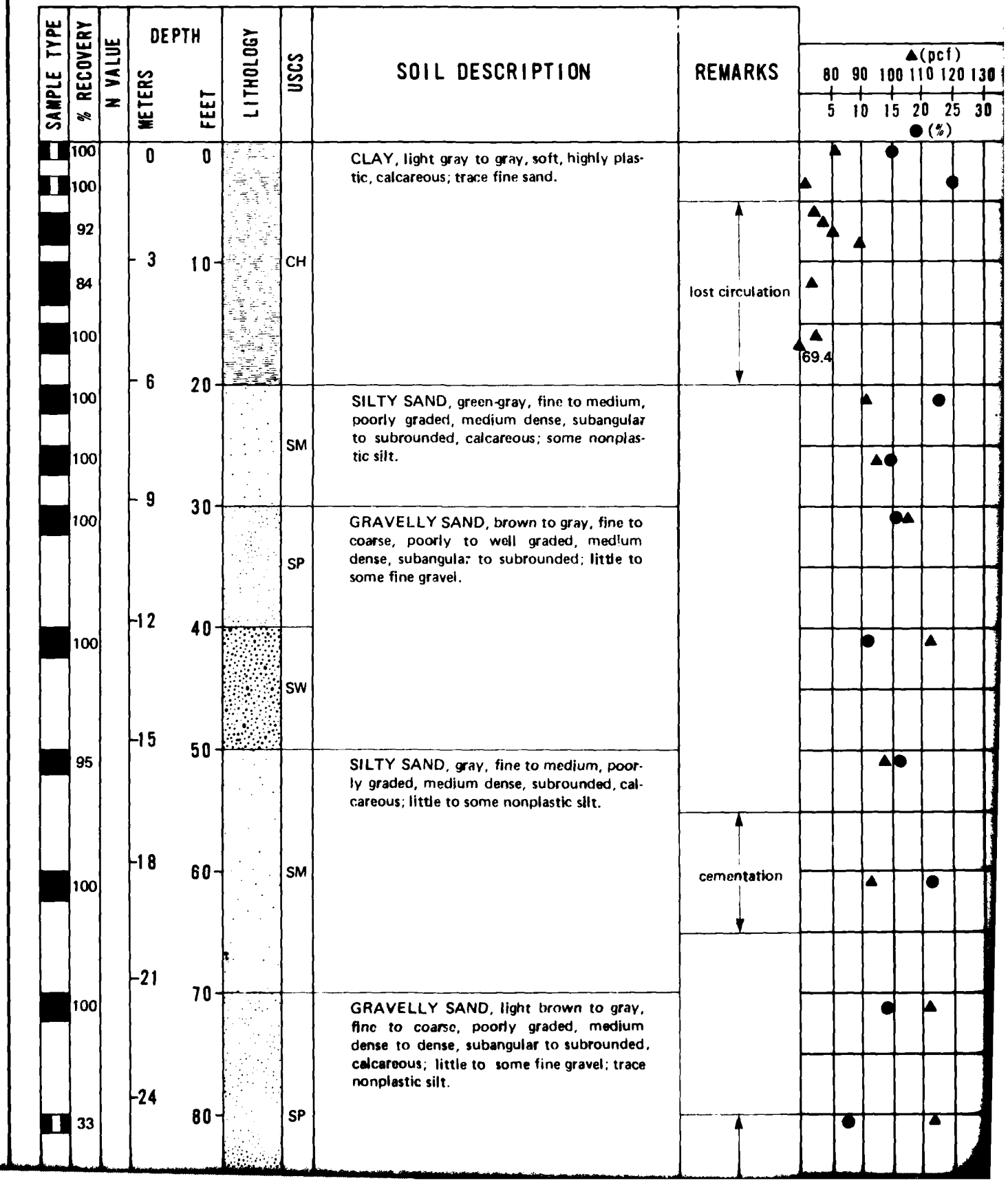
Drilling Method - signifies the type of drilling procedure used such as rotary wash.

Hole Diameter - nominal size of boring drilled.

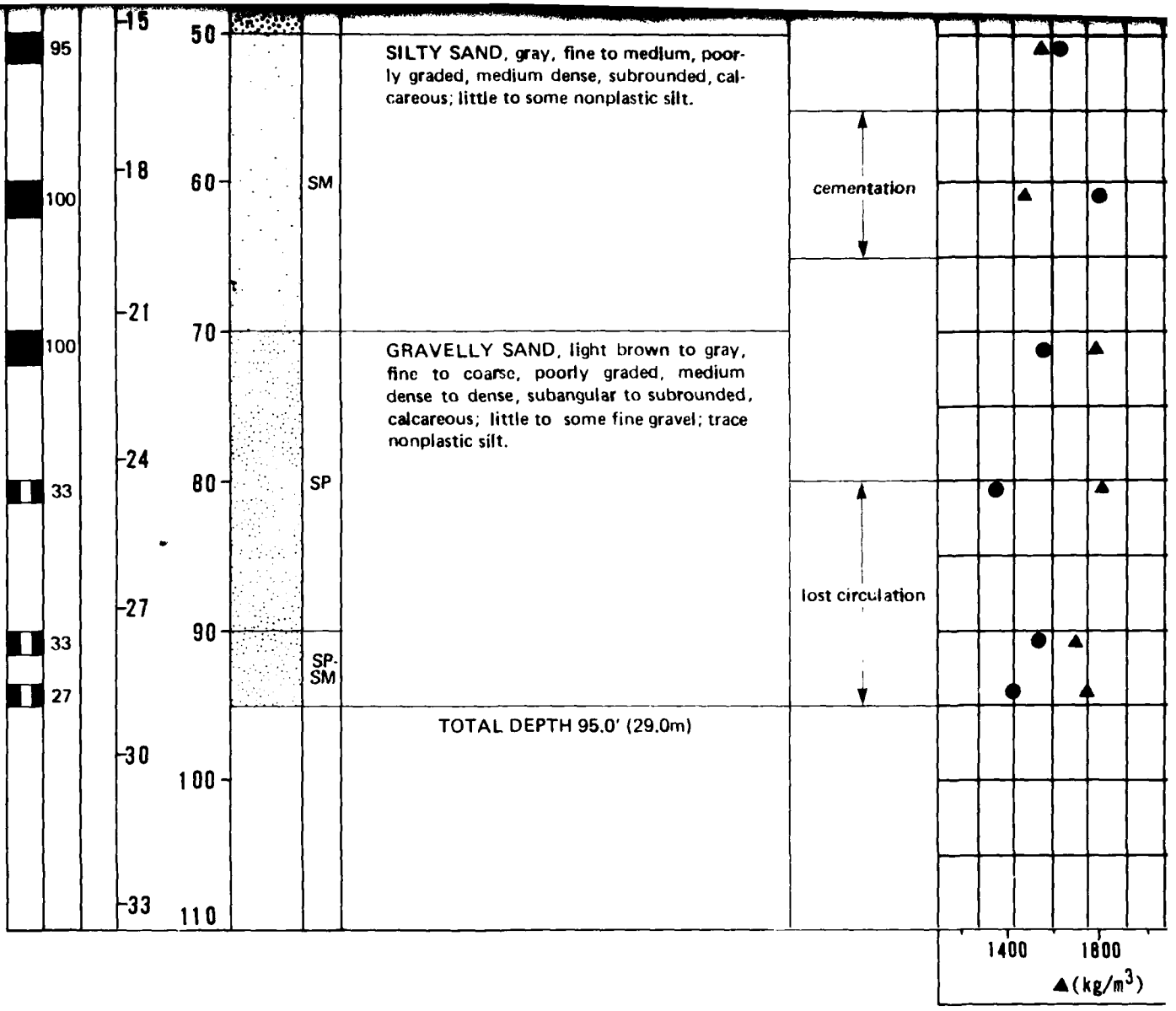
Water Level - indicates depth from ground surface to water table where encountered.

Trench Length - length at ground surface of final trench excavation.

Trench Orientation - bearing of longitudinal trench centerline.


SAMPLE TYPE
% RECOVERY
N VALUE
DEPTH
METERS
FEET
LITHOLOGY
USCS
SOIL DESCRIPTION
REMARKS
▲(pcf)
80 90 100 110 120 130
5 10 15 20 25 30
●(%)
100
100
92
84
100
100
100
100
100
95
100
33
0
3
6
9
12
15
18
21
24
0
10
20
30
40
50
60
70
80
CH
SM
SP
SW
SM
SP
CLAY, light gray to gray, soft, highly plastic, calcareous; trace fine sand.
SILTY SAND, green-gray, fine to medium, poorly graded, medium dense, subangular to subrounded, calcareous; some nonplastic silt.
GRAVELLY SAND, brown to gray, fine to coarse, poorly to well graded, medium dense, subangular to subrounded; little to some fine gravel.
SILTY SAND, gray, fine to medium, poorly graded, medium dense, subrounded, calcareous; little to some nonplastic silt.
GRAVELLY SAND, light brown to gray, fine to coarse, poorly graded, medium dense to dense, subangular to subrounded, calcareous; little to some fine gravel; trace nonplastic silt.
lost circulation
69.4
cementation

DEPTH FEET	LITHOLOGY	USCS	SOIL DESCRIPTION	REMARKS	▲(pcf) 80 90 100 110 120 130 140 / ●(%) 5 10 15 20 25 30 35	SIEVE ANALYSIS GR	SA	FI	LL	PI
0			CLAY, light gray to gray, soft, highly plastic, calcareous; trace fine sand.			0	3	97	69	47
10		CH		lost circulation	40.0, 40.4, 51.3, 43.8, 69.4, 44.8	0	7	93	52	32
20		SM	SILTY SAND, green-gray, fine to medium, poorly graded, medium dense, subangular to subrounded, calcareous; some nonplastic silt.			0	76	24		NP
30		SP	GRAVELLY SAND, brown to gray, fine to coarse, poorly to well graded, medium dense, subangular to subrounded; little to some fine gravel.			19	77	4		
40		SW				26	70	4		
50		SM	SILTY SAND, gray, fine to medium, poorly graded, medium dense, subrounded, calcareous; little to some nonplastic silt.							
60				cementation						
70		SP	GRAVELLY SAND, light brown to gray, fine to coarse, poorly graded, medium dense to dense, subangular to subrounded, calcareous; little to some fine gravel; trace nonplastic silt.			31	65	4		
80										



EXPLANATION

- ERTEC DRIVE SAMPLE
- BULK SAMPLE
- PITCHER TUBE SAMPLE
- STANDARD PENETRATION TEST SAMPLE
- CORE SAMPLE
- N – STANDARD PENETRATION RESISTANCE
- ▲ – DRY UNIT WEIGHT (ASTM: D-2937-71)
- ● – MOISTURE CONTENT (ASTM: D-2216-71)
- NR – NO RECOVERY

BORING DETAILS

ELEVATION
SURFICIAL GEOLOGIC UN
DATE DRILLED
DRILLING METHOD
HOLE DIAMETER
WATER LEVEL

LOG OF BORING CV-B-1
CAVE VALLEY, NEVADA

29 OCT 81

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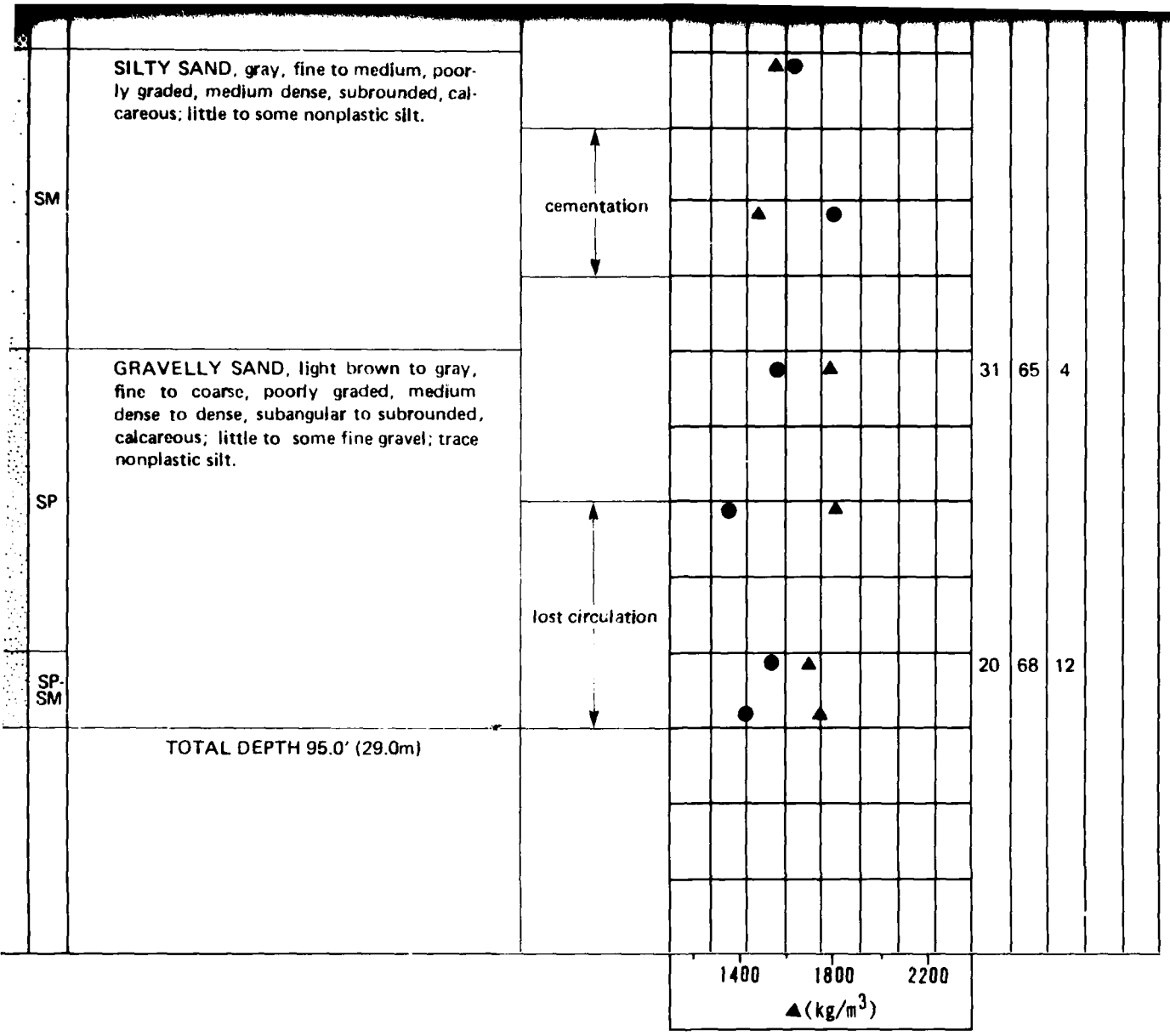
FIGURE II-6-1

3

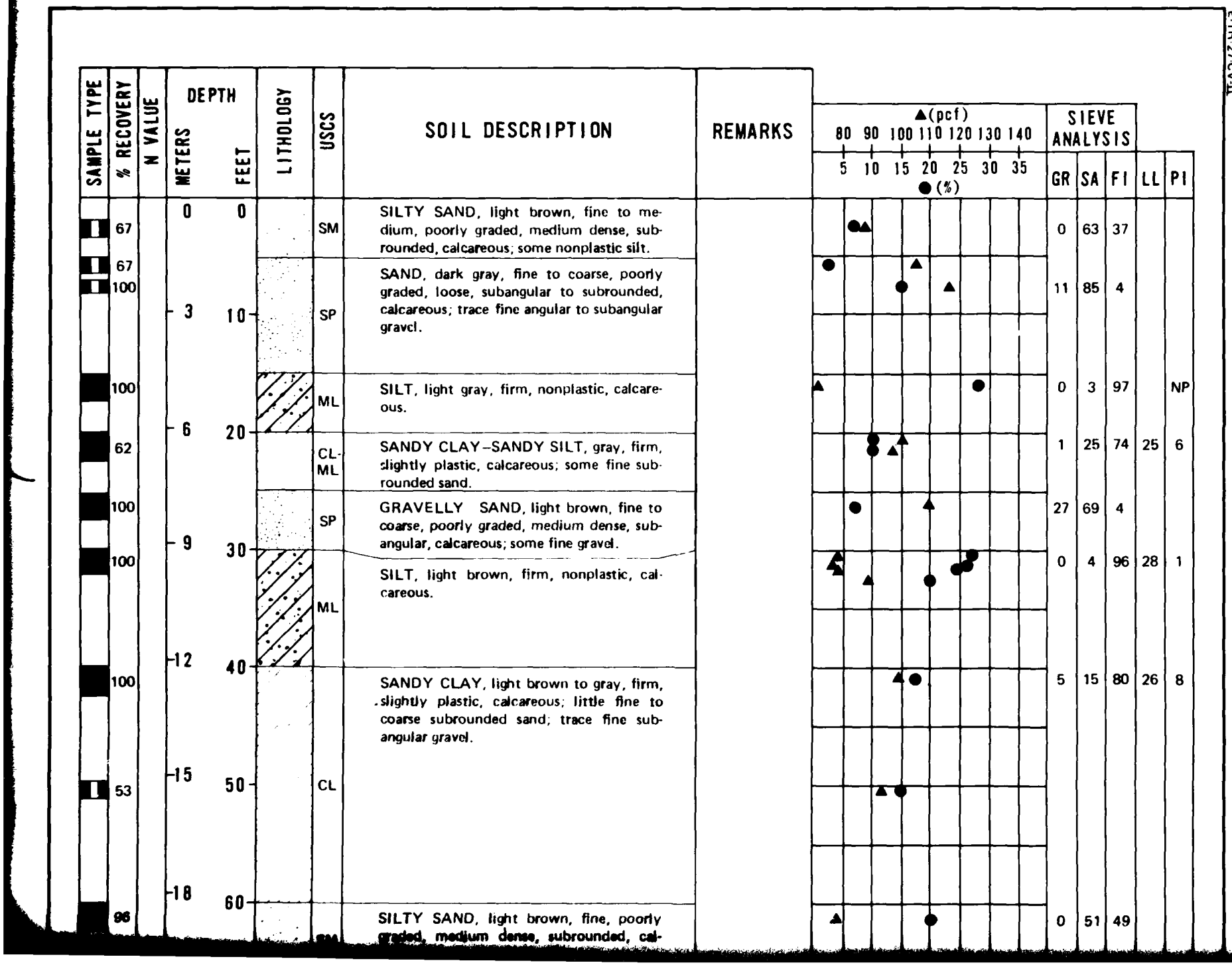


EXPLANATION

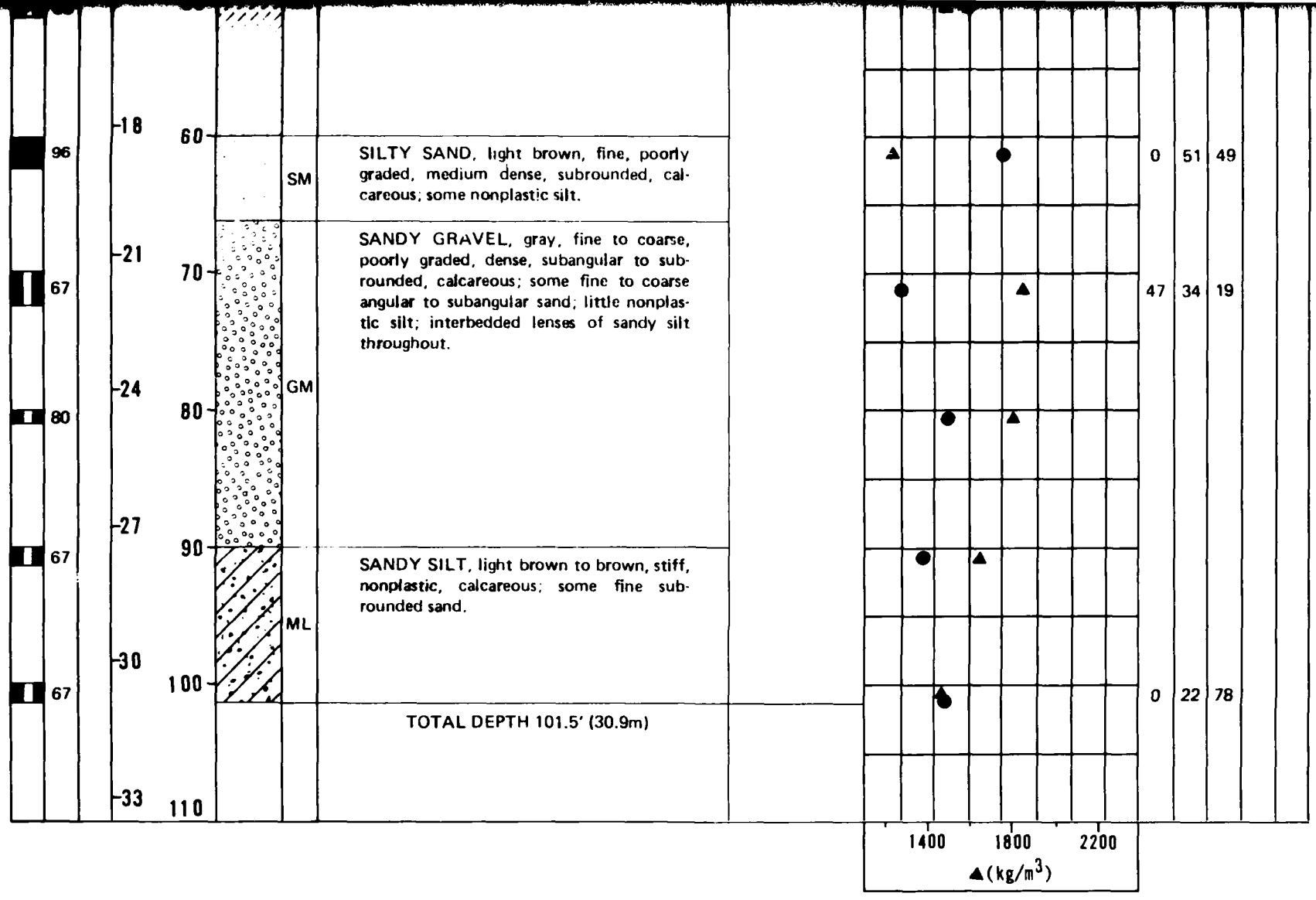
- ERTEC DRIVE SAMPLE
- BULK SAMPLE
- PITCHER TUBE SAMPLE
- STANDARD PENETRATION TEST SAMPLE
- CORE SAMPLE
- STANDARD PENETRATION RESISTANCE
- DRY UNIT WEIGHT (ASTM: D-2937-71)
- MOISTURE CONTENT (ASTM: D-2216-71)

BORING DETAILS

ELEVATION	: 5980' (1823m)
SURFICIAL GEOLOGIC UNIT	: A4o
DATE DRILLED	: 5-6 November 1979
DRILLING METHOD	: Rotary Wash
HOLE DIAMETER	: 4 7/8" (124mm)
WATER LEVEL	: Not Encountered



SAMPLE TYPE	% RECOVERY	N VALUE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	SOIL DESCRIPTION	REMARKS	▲(pcf) 80 90 100 110 120 130 140 / ●(%) 5 10 15 20 25 30 35	SIEVE ANALYSIS GR	SA	FI	LL	PI
	67		0	0		SM	SILTY SAND, light brown, fine to medium, poorly graded, medium dense, subrounded, calcareous; some nonplastic silt.			0	63	37		
	67					SP	SAND, dark gray, fine to coarse, poorly graded, loose, subangular to subrounded, calcareous; trace fine angular to subangular gravel.			11	85	4		
	100		3	10		ML	SILT, light gray, firm, nonplastic, calcareous.			0	3	97		NP
	62		6	20		CL-ML	SANDY CLAY–SANDY SILT, gray, firm, slightly plastic, calcareous; some fine subrounded sand.			1	25	74	25	6
	100					SP	GRAVELLY SAND, light brown, fine to coarse, poorly graded, medium dense, subangular, calcareous; some fine gravel.			27	69	4		
	100		9	30		ML	SILT, light brown, firm, nonplastic, calcareous.			0	4	96	28	1
	100		12	40		CL	SANDY CLAY, light brown to gray, firm, slightly plastic, calcareous; little fine to coarse subrounded sand; trace fine subangular gravel.			5	15	80	26	8
	53		15	50										
	96		18	60			SILTY SAND, light brown, fine, poorly graded, medium dense, subrounded, cal-			0	51	49		



EXPLANATION

- ERTEC DRIVE SAMPLE
- BULK SAMPLE
- PITCHER TUBE SAMPLE
- STANDARD PENETRATION TEST SAMPLE
- CORE SAMPLE

N - STANDARD PENETRATION RESISTANCE

BORING DETAILS

ELEVATION	: 6010' (1832m)
SURFICIAL GEOLOGIC UNIT	: A4o
DATE DRILLED	: 14 November 1979
DRILLING METHOD	: Rotary Wash
HOLE DIAMETER	: 4 7/8" (124mm)
WATER LEVEL	: Not Encountered

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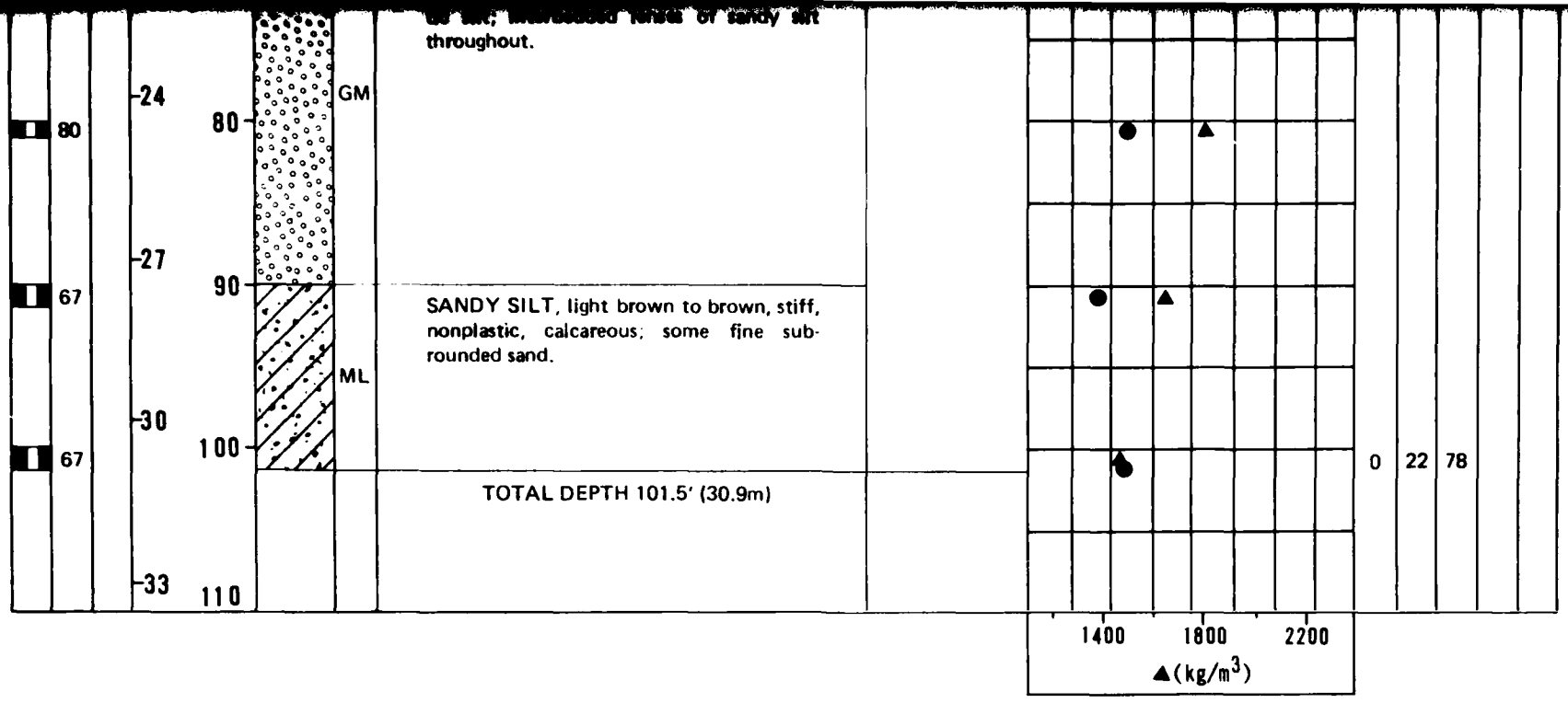

EXPLANATION

- ERTEC DRIVE SAMPLE
- BULK SAMPLE
- PITCHER TUBE SAMPLE
- STANDARD PENETRATION TEST SAMPLE
- CORE SAMPLE
- N – STANDARD PENETRATION RESISTANCE
- ▲ – DRY UNIT WEIGHT (ASTM: D-2937-71)
- ● – MOISTURE CONTENT (ASTM: D-2216-71)
- NR – NO RECOVERY

BORING DETAILS

ELEVATION	: 6010' (1832m)
SURFICIAL GEOLOGIC UNIT	: A4o
DATE DRILLED	: 14 November 1979
DRILLING METHOD	: Rotary Wash
HOLE DIAMETER	: 4 7/8" (124mm)
WATER LEVEL	: Not Encountered

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LOG OF BORING CV-B-2
CAVE VALLEY, NEVADA

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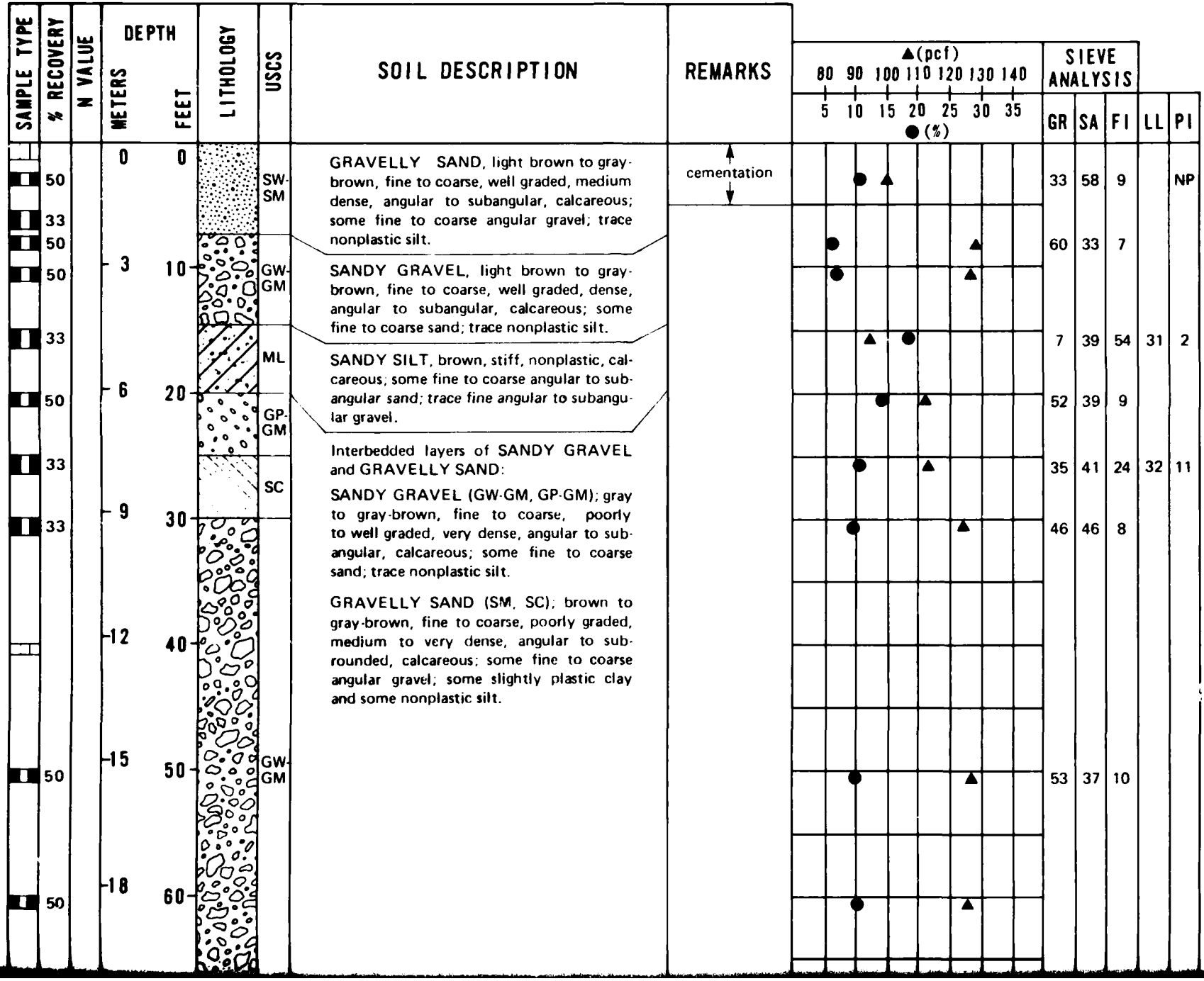
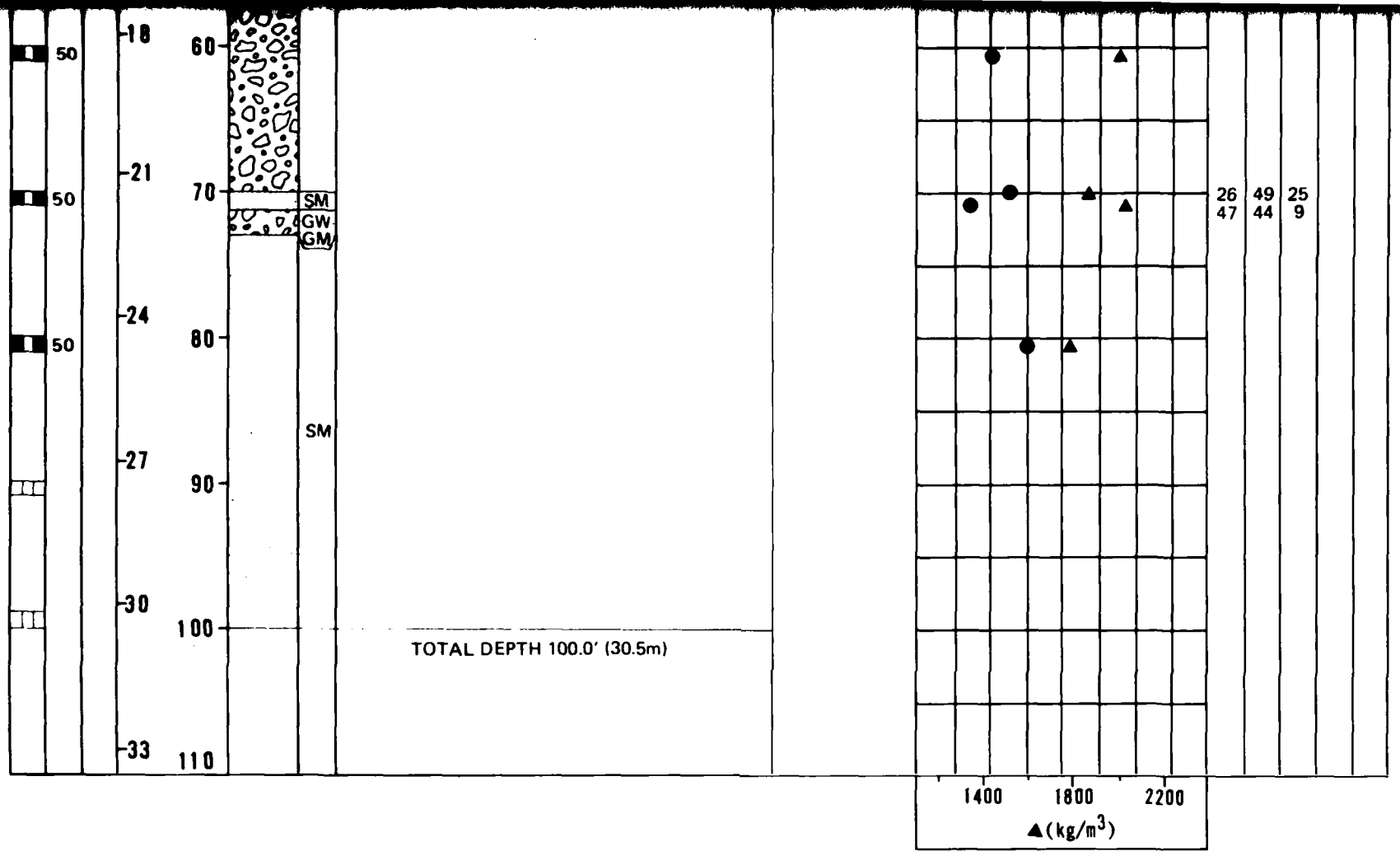
FIGURE B-6-2


SAMPLE TYPE
% RECOVERY
N VALUE
DEPTH
METERS
FEET
LITHOLOGY
USCS
SOIL DESCRIPTION
REMARKS
▲(pcf)
80 90 100 110 120 130 140
5 10 15 20 25 30 35
● (%)
SIEVE ANALYSIS
GR SA FI LL PI
50
33
50
50
33
50
33
33
50
50
0 0
3 10
6 20
9 30
12 40
15 50
18 60
SW-SM
GW-GM
ML
GP-GM
SC
GW-GM
GRAVELLY SAND, light brown to gray-brown, fine to coarse, well graded, medium dense, angular to subangular, calcareous; some fine to coarse angular gravel; trace nonplastic silt.
SANDY GRAVEL, light brown to gray-brown, fine to coarse, well graded, dense, angular to subangular, calcareous; some fine to coarse sand; trace nonplastic silt.
SANDY SILT, brown, stiff, nonplastic, calcareous; some fine to coarse angular to subangular sand; trace fine angular to subangular gravel.
Interbedded layers of SANDY GRAVEL and GRAVELLY SAND:
SANDY GRAVEL (GW-GM, GP-GM); gray to gray-brown, fine to coarse, poorly to well graded, very dense, angular to subangular, calcareous; some fine to coarse sand; trace nonplastic silt.
GRAVELLY SAND (SM, SC); brown to gray-brown, fine to coarse, poorly graded, medium to very dense, angular to subrounded, calcareous; some fine to coarse angular gravel; some slightly plastic clay and some nonplastic silt.
cementation
33 58 9 NP
60 33 7
7 39 54 31 2
52 39 9
35 41 24 32 11
46 46 8
53 37 10



EXPLANATION

- ERTEC DRIVE SAMPLE
- BULK SAMPLE
- PITCHER TUBE SAMPLE
- STANDARD PENETRATION TEST SAMPLE
- CORE SAMPLE
- N - STANDARD PENETRATION RESISTANCE
- ▲ - DRY UNIT WEIGHT (ASTM: D-2937-71)
- ● - MOISTURE CONTENT (ASTM: D-2216-71)

BORING DETAILS

ELEVATION	: 6500' (1981m)
SURFICIAL GEOLOGIC UNIT	: A5i
DATE DRILLED	: 14 November 1979
DRILLING METHOD	: Rotary Wash
HOLE DIAMETER	: 4 7/8" (124mm)
WATER LEVEL	: Not Encountered

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LOG OF BORING CV-
CAVE VALLEY, NEVA

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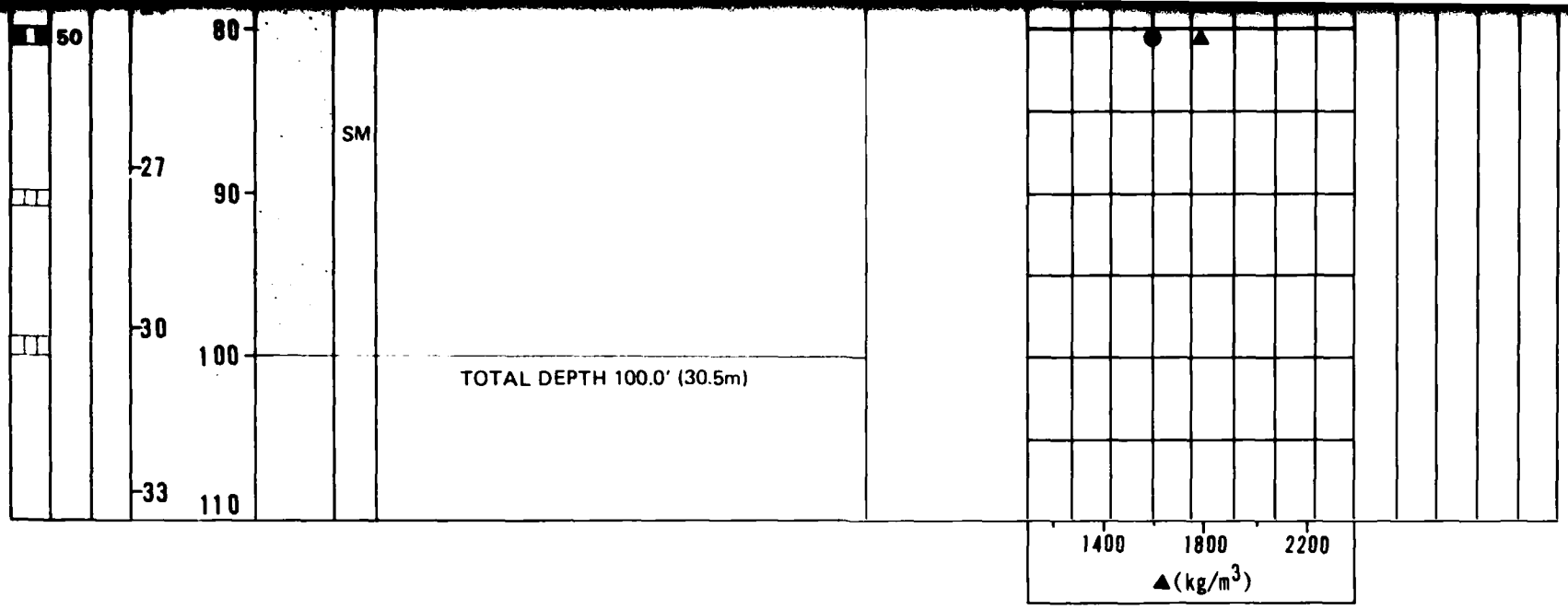

EXPLANATION

- ERTEC DRIVE SAMPLE
- BULK SAMPLE
- PITCHER TUBE SAMPLE
- STANDARD PENETRATION TEST SAMPLE
- CORE SAMPLE
- N – STANDARD PENETRATION RESISTANCE
- ▲ – DRY UNIT WEIGHT (ASTM: D-2937-71)
- ● – MOISTURE CONTENT (ASTM: D-2216-71)
- NR – NO RECOVERY

BORING DETAILS

ELEVATION	: 6500' (1981m)
SURFICIAL GEOLOGIC UNIT	: A5i
DATE DRILLED	: 14 November 1979
DRILLING METHOD	: Rotary Wash
HOLE DIAMETER	: 4 7/8" (124mm)
WATER LEVEL	: Not Encountered

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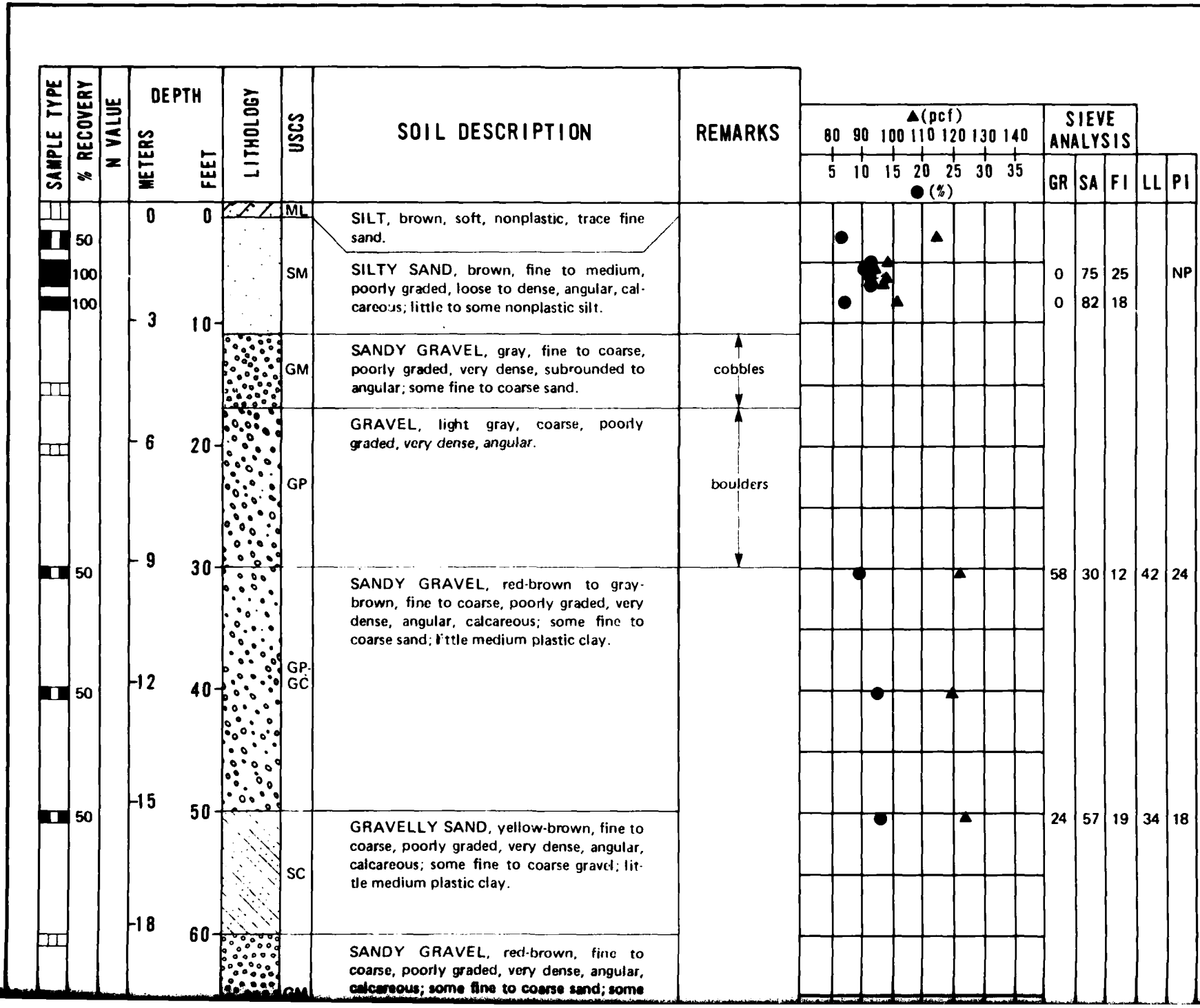
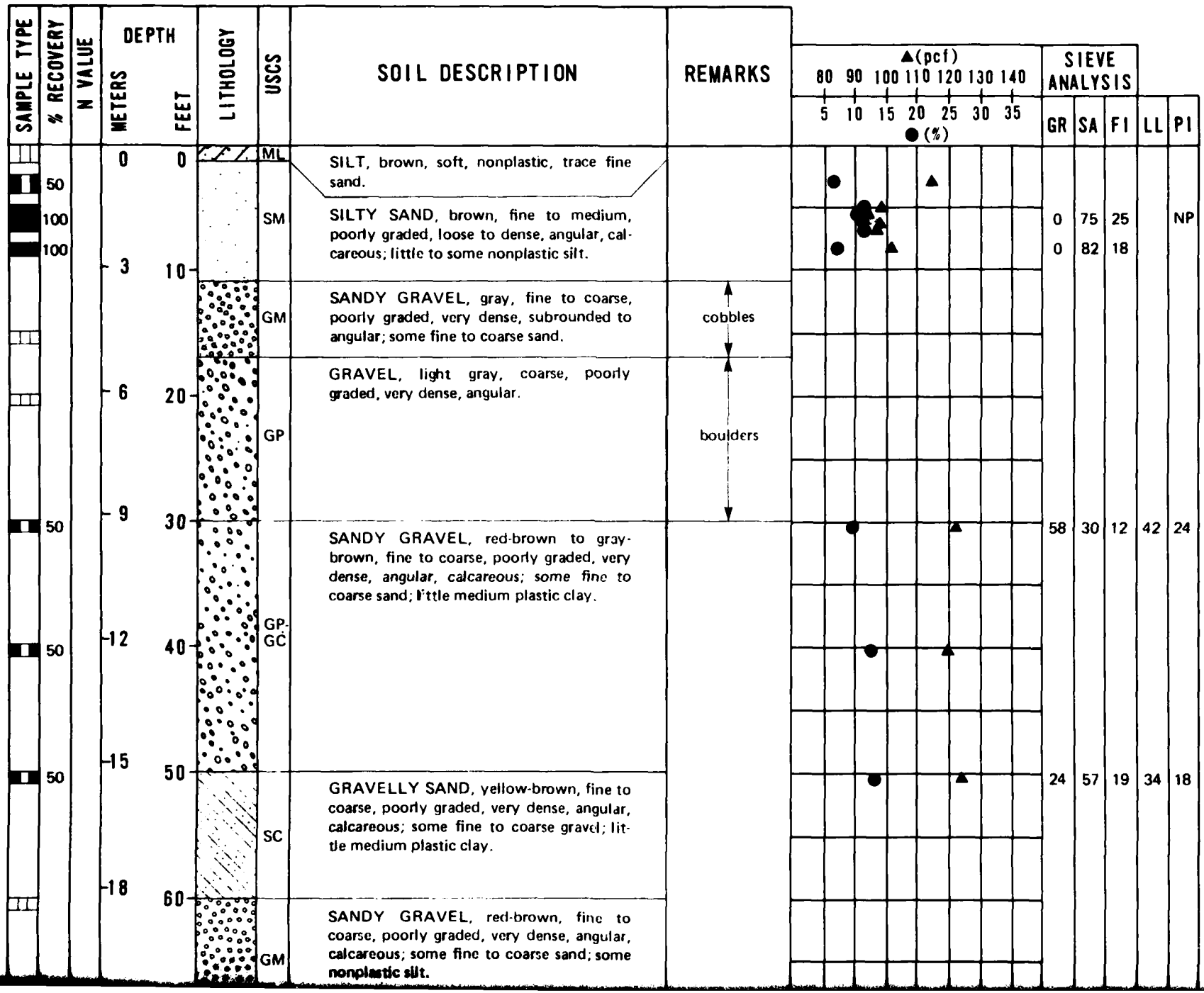
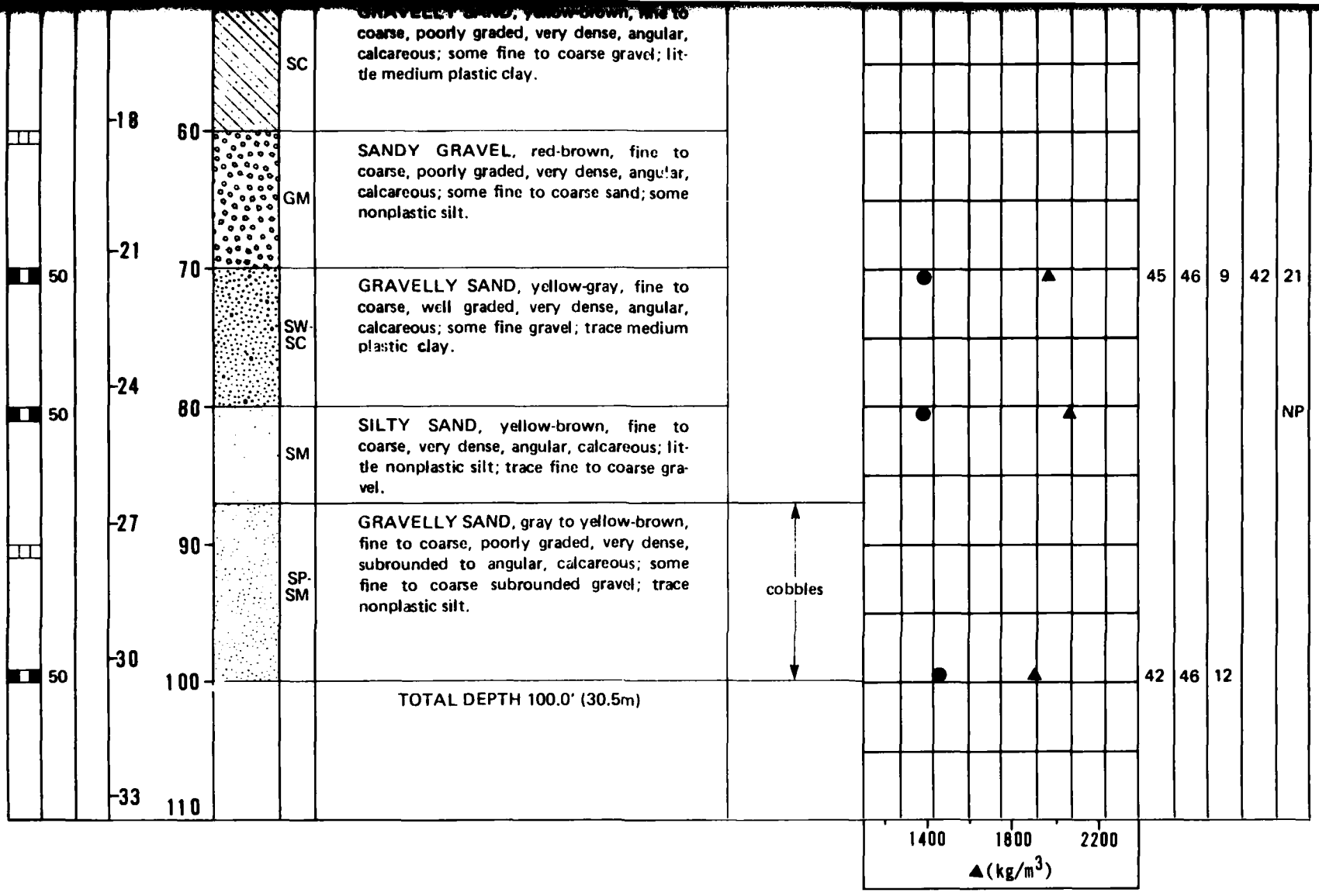
LOG OF BORING CV-B-3
CAVE VALLEY, NEVADA

26 OCT 81

FIGURE B-6-3


SAMPLE TYPE
% RECOVERY
N VALUE
DEPTH
METERS
FEET
LITHOLOGY
USCS
SOIL DESCRIPTION
REMARKS
▲(pcf)
80 90 100 110 120 130 140
5 10 15 20 25 30 35
● (%)
SIEVE ANALYSIS
GR SA FI LL PI
50
100
100
50
50
50
0 0
3 10
6 20
9 30
12 40
15 50
18 60
ML
SM
GM
GP
GP-GC
SC
GM
SILT, brown, soft, nonplastic, trace fine sand.
SILTY SAND, brown, fine to medium, poorly graded, loose to dense, angular, calcareous; little to some nonplastic silt.
SANDY GRAVEL, gray, fine to coarse, poorly graded, very dense, subrounded to angular; some fine to coarse sand.
GRAVEL, light gray, coarse, poorly graded, very dense, angular.
SANDY GRAVEL, red-brown to gray-brown, fine to coarse, poorly graded, very dense, angular, calcareous; some fine to coarse sand; little medium plastic clay.
GRAVELLY SAND, yellow-brown, fine to coarse, poorly graded, very dense, angular, calcareous; some fine to coarse gravel; little medium plastic clay.
SANDY GRAVEL, red-brown, fine to coarse, poorly graded, very dense, angular, calcareous; some fine to coarse sand; some
cobbles
boulders
0 75 25 NP
0 82 18
58 30 12 42 24
24 57 19 34 18


SAMPLE TYPE
% RECOVERY
N VALUE
DEPTH
METERS
FEET
LITHOLOGY
USCS
SOIL DESCRIPTION
REMARKS
▲(pcf)
80 90 100 110 120 130 140
5 10 15 20 25 30 35
● (%)
SIEVE ANALYSIS
GR SA FI LL PI
50
100
100
50
50
50
0 0
3 10
6 20
9 30
12 40
15 50
18 60
ML
SM
GM
GP
GP-GC
SC
GM
SILT, brown, soft, nonplastic, trace fine sand.
SILTY SAND, brown, fine to medium, poorly graded, loose to dense, angular, calcareous; little to some nonplastic silt.
SANDY GRAVEL, gray, fine to coarse, poorly graded, very dense, subrounded to angular; some fine to coarse sand.
GRAVEL, light gray, coarse, poorly graded, very dense, angular.
SANDY GRAVEL, red-brown to gray-brown, fine to coarse, poorly graded, very dense, angular, calcareous; some fine to coarse sand; little medium plastic clay.
GRAVELLY SAND, yellow-brown, fine to coarse, poorly graded, very dense, angular, calcareous; some fine to coarse gravel; little medium plastic clay.
SANDY GRAVEL, red-brown, fine to coarse, poorly graded, very dense, angular, calcareous; some fine to coarse sand; some nonplastic silt.
cobbles
boulders
0 75 25 NP
0 82 18
58 30 12 42 24
24 57 19 34 18



EXPLANATION

- ERTEC DRIVE SAMPLE
- BU'K SAMPLE
- FITCHER TUBE SAMPLE
- STANDARD PENETRATION TEST SAMPLE
- CORE SAMPLE

N - STANDARD PENETRATION RESISTANCE

BORING DETAILS

ELEVATION	: 6240' (1902m)
SURFICIAL GEOLOGIC UNIT	: A1
DATE DRILLED	: 15 November 1979
DRILLING METHOD	: Rotary Wash
HOLE DIAMETER	: 4 7/8" (124mm)
WATER LEVEL	: Not Encountered

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LOG OF BOR
CAVE VALLE

DEPAR MX

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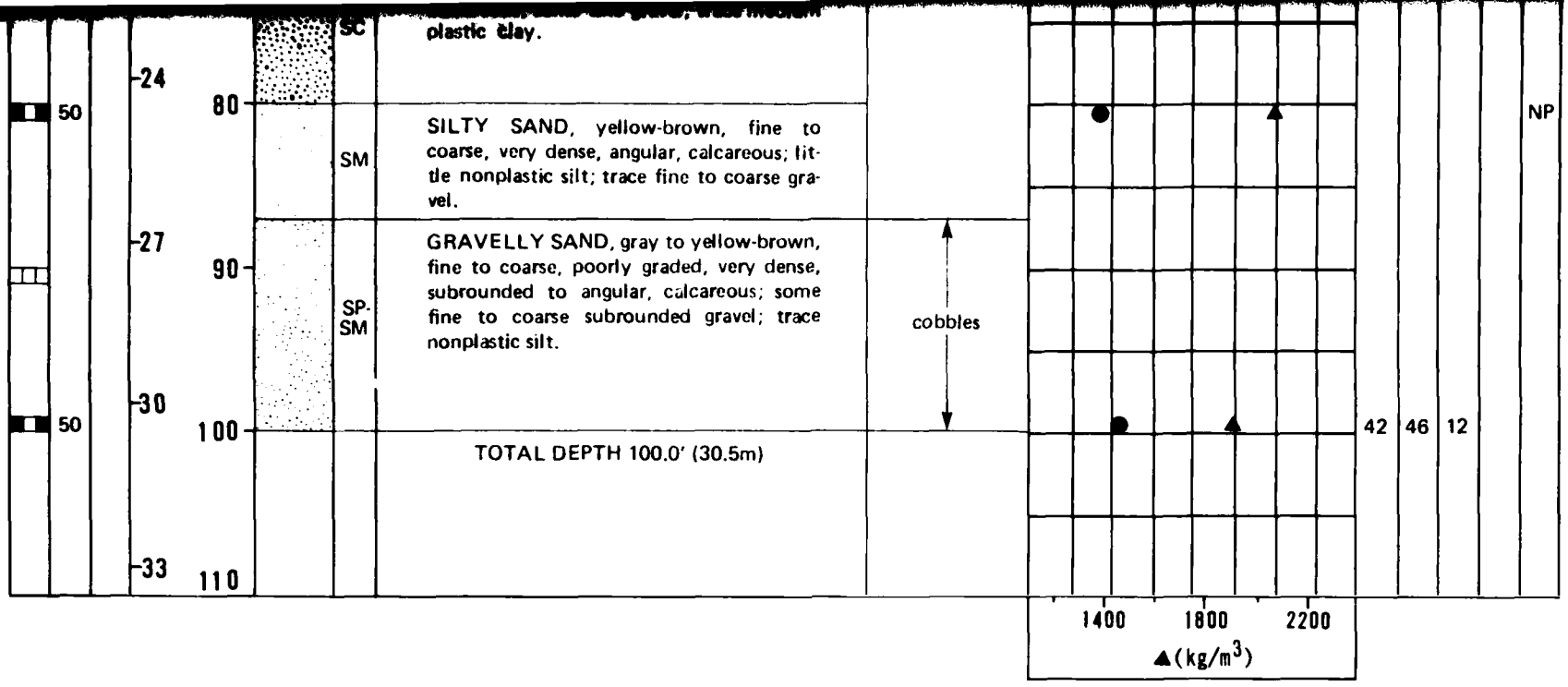

EXPLANATION

- ERTEC DRIVE SAMPLE
- BULK SAMPLE
- PITCHER TUBE SAMPLE
- STANDARD PENETRATION TEST SAMPLE
- CORE SAMPLE
- N – STANDARD PENETRATION RESISTANCE
- ▲ – DRY UNIT WEIGHT (ASTM: D-2937-71)
- ● – MOISTURE CONTENT (ASTM: D-2216-71)
- NR – NO RECOVERY

BORING DETAILS

ELEVATION	: 6240' (1902m)
SURFICIAL GEOLOGIC UNIT	: A1
DATE DRILLED	: 15 November 1979
DRILLING METHOD	: Rotary Wash
HOLE DIAMETER	: 4 7/8" (124mm)
WATER LEVEL	: Not Encountered

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LOG OF BORING CV-B-4
CAVE VALLEY, NEVADA

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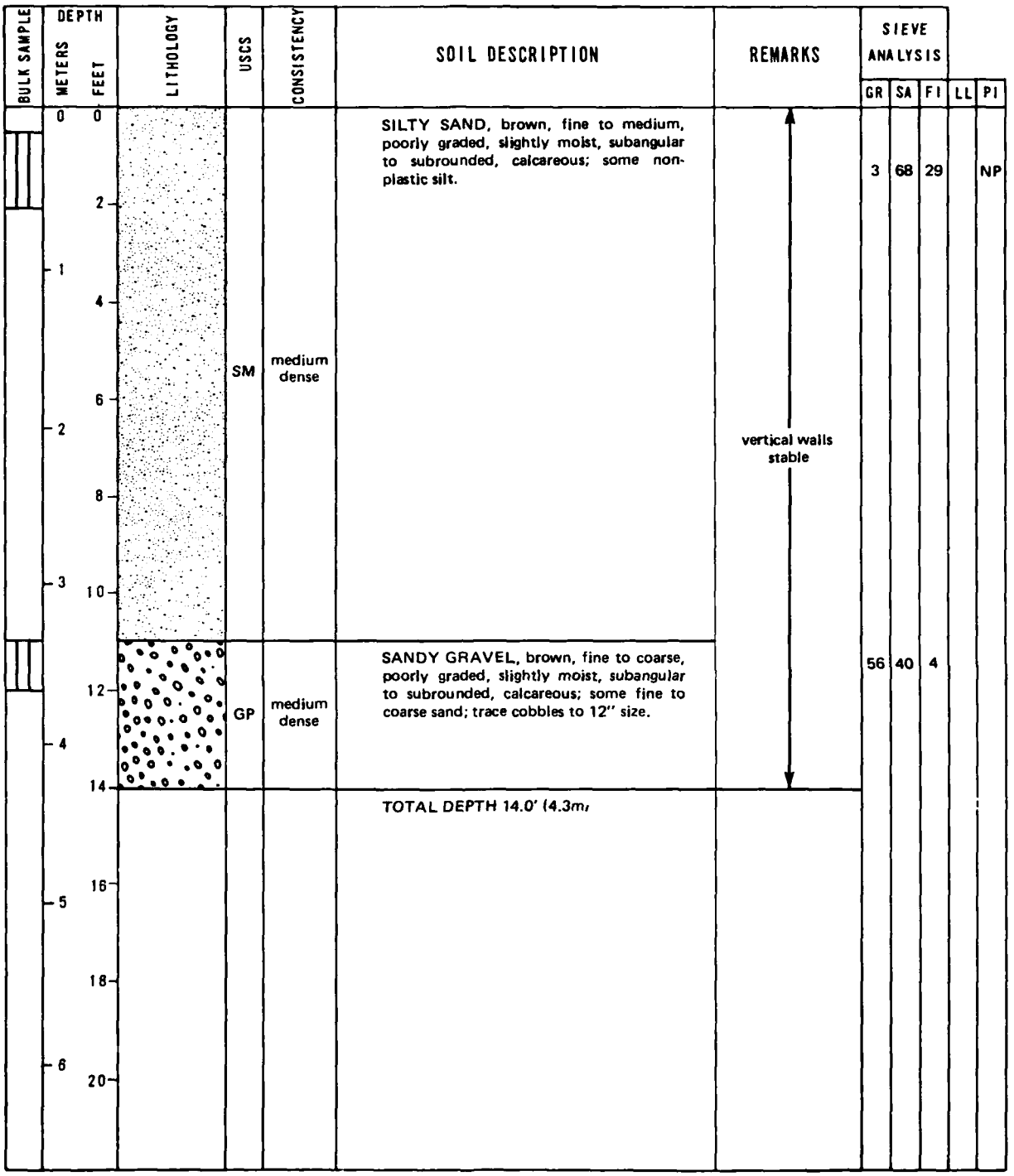
FIGURE II-6-4

7.0 TRENCH AND TEST PIT LOGS

See Section 6.0, "Boring Logs", for explanation.



TRENCH DETAILS

SURFACE ELEVATION	: 6240' (1902m)
DATE EXCAVATED	: 18 October 1979
SURFICIAL GEOLOGIC UNIT	: A1
TRENCH LENGTH	: 16.0' (4.9m)
TRENCH ORIENTATION	: E - W

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LOG OF TRENCH CV-T-1
CAVE VALLEY, NEVADA

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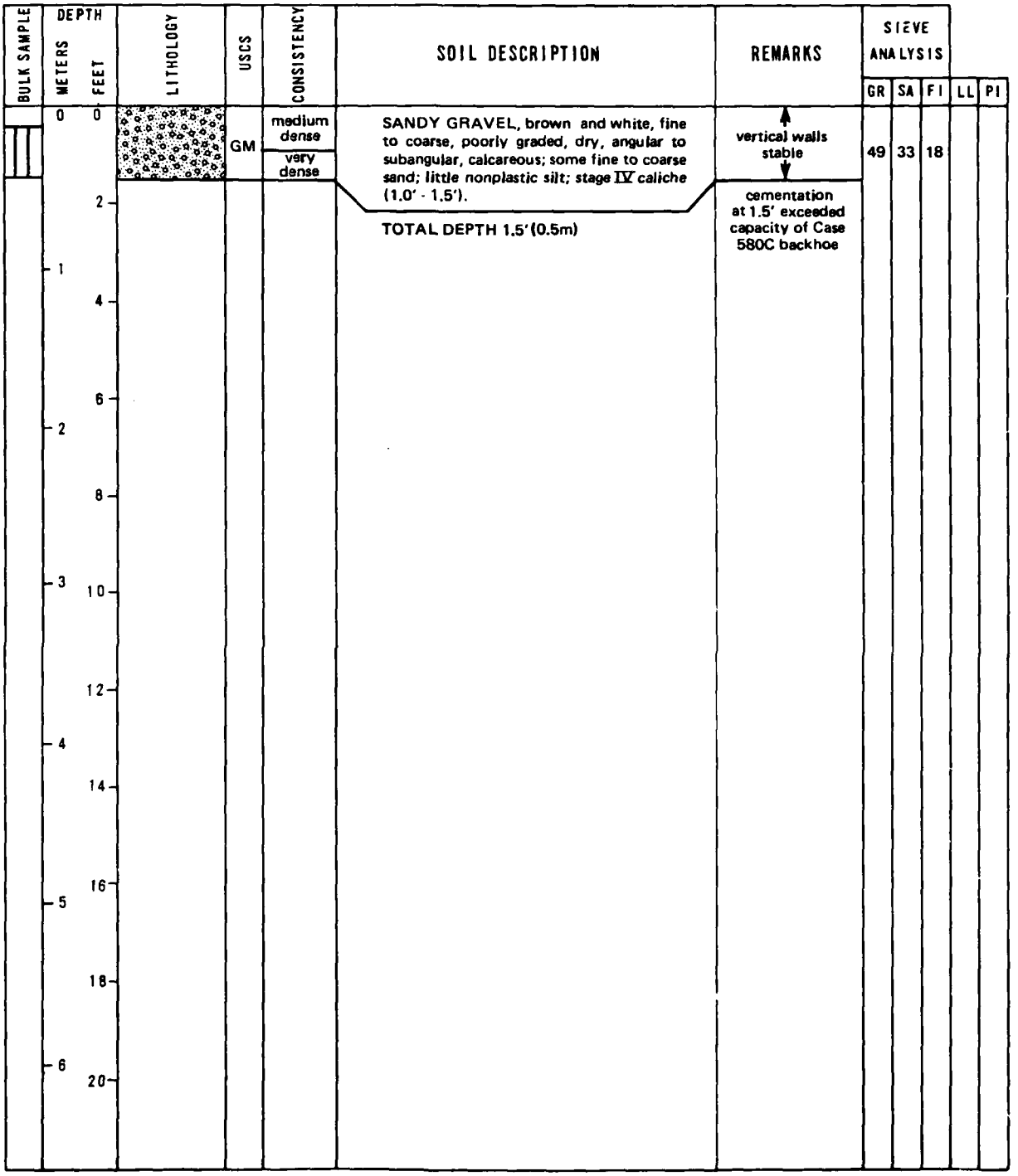
FIGURE II-7-1

E-TR-27-CV-II



TRENCH DETAILS

SURFACE ELEVATION	: 6500' (1981m)
DATE EXCAVATED	: 18 October 1979
SURFICIAL GEOLOGIC UNIT	: A5i
TRENCH LENGTH	: 8.0' (2.4m)
TRENCH ORIENTATION	: E - W

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LOG OF TRENCH CV-T-2
CAVE VALLEY, NEVADA

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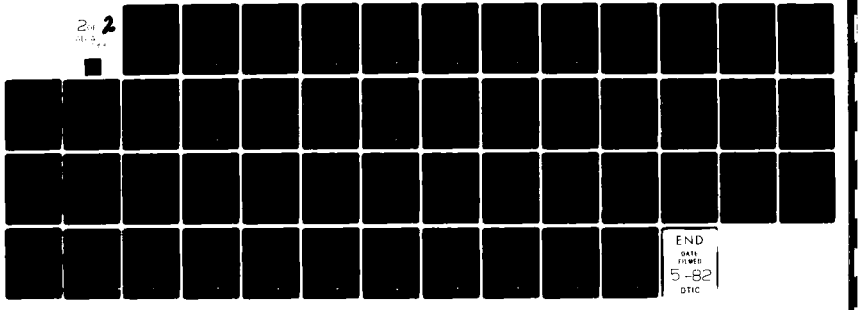
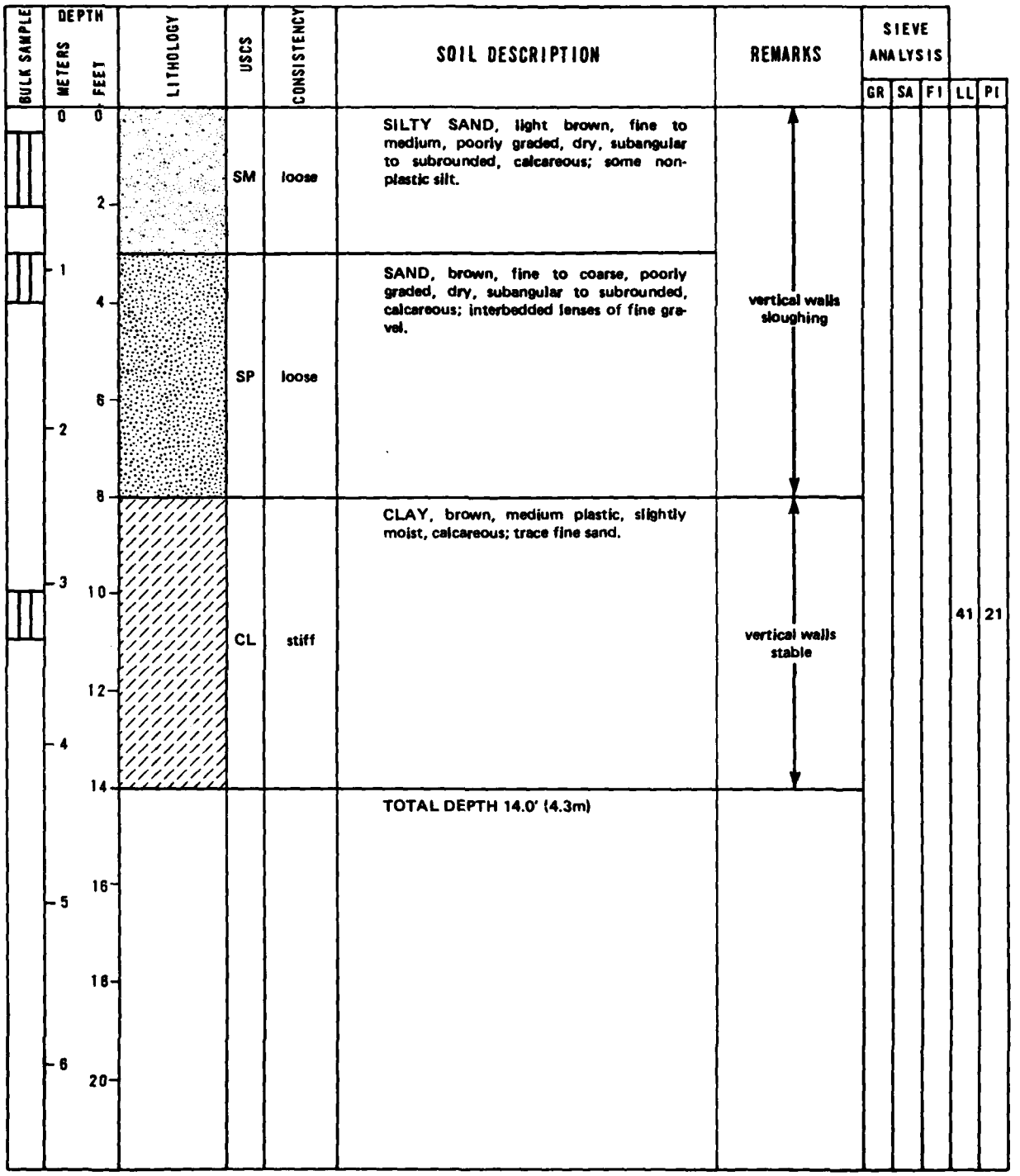
FIGURE II-7-2

AD-A112 991 ERTEC WESTERN INC LONG BEACH CA F/G 8/13
MX SITING INVESTIGATION GEOTECHNICAL EVALUATION, VERIFICATION S--ETC(U)
OCT 81 F04704-80-C-0006
UNCLASSIFIED E-TR-27-CV-2 NL




A
299



TRENCH DETAILS

SURFACE ELEVATION : 5995' (1827m)
DATE EXCAVATED : 18 October 1979
SURFICIAL GEOLOGIC UNIT : A4o
TRENCH LENGTH : 16.0' (4.9m)
TRENCH ORIENTATION : E - W

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LOG OF TRENCH CV-T-3
CAVE VALLEY, NEVADA

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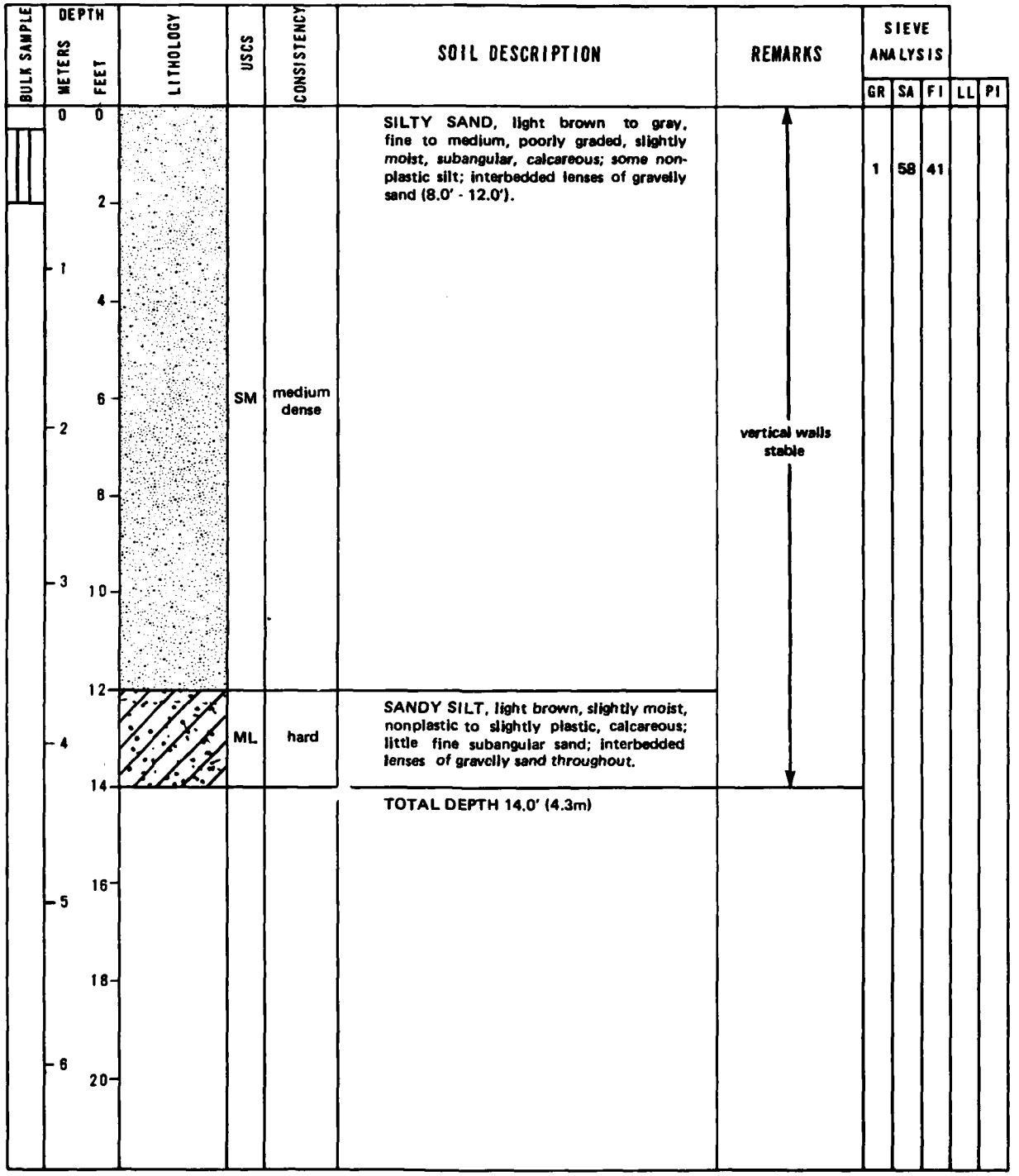
FIGURE II-7-3



TRENCH DETAILS

SURFACE ELEVATION	: 6010' (1832m)
DATE EXCAVATED	: 19 October 1979
SURFICIAL GEOLOGIC UNIT	: A4o
TRENCH LENGTH	: 16.0' (4.9m)
TRENCH ORIENTATION	: E - W

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LOG OF TRENCH CV-T-4
CAVE VALLEY, NEVADA

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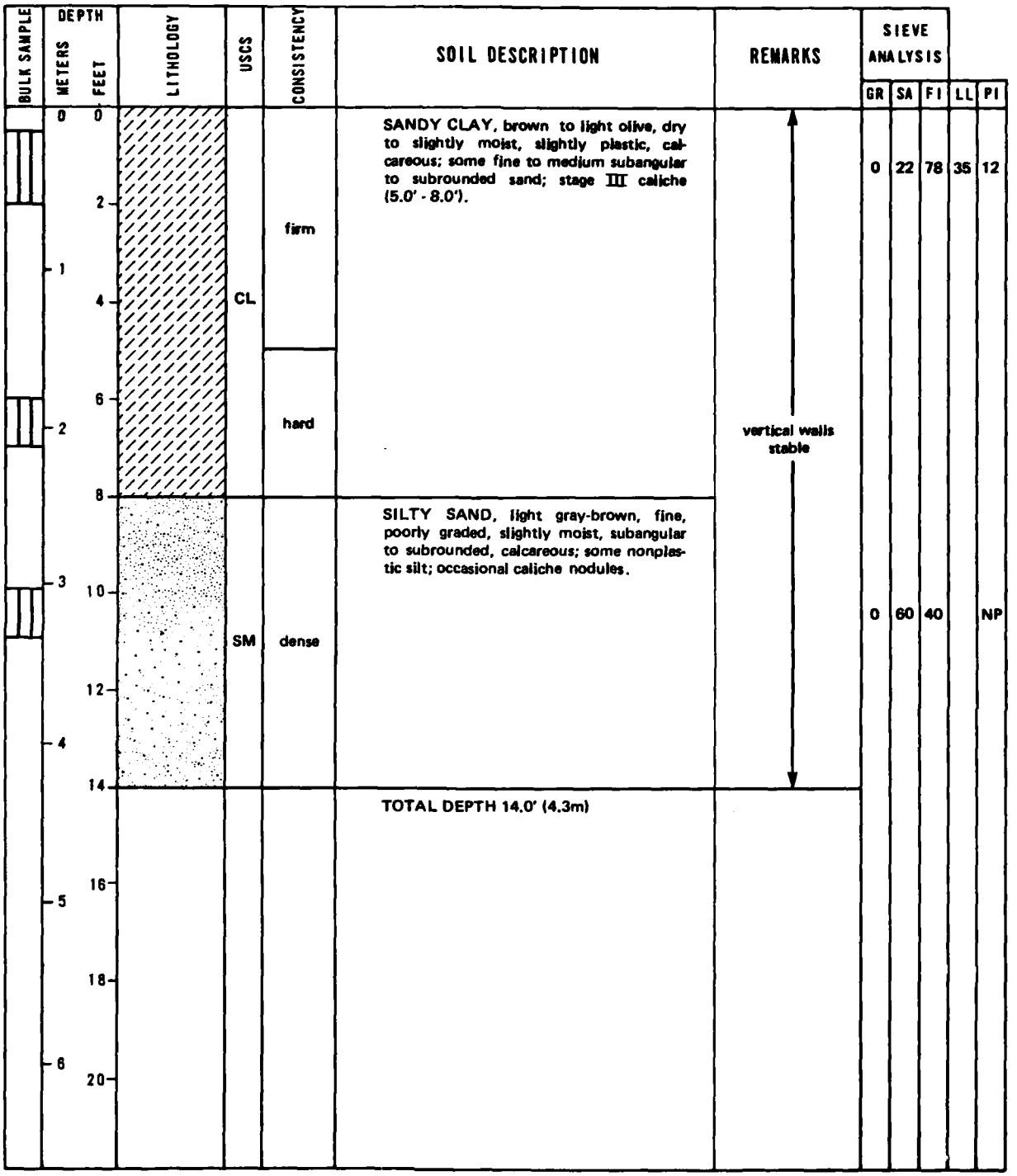
FIGURE II-7-4

E-TR-27-CV-II



TRENCH DETAILS

SURFACE ELEVATION : 5985' (1824m)
DATE EXCAVATED : 19 October 1979
SURFICIAL GEOLOGIC UNIT : A5y
TRENCH LENGTH : 16.0' (4.9m)
TRENCH ORIENTATION : NW - SE

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LOG OF TRENCH CV-T-5
CAVE VALLEY, NEVADA

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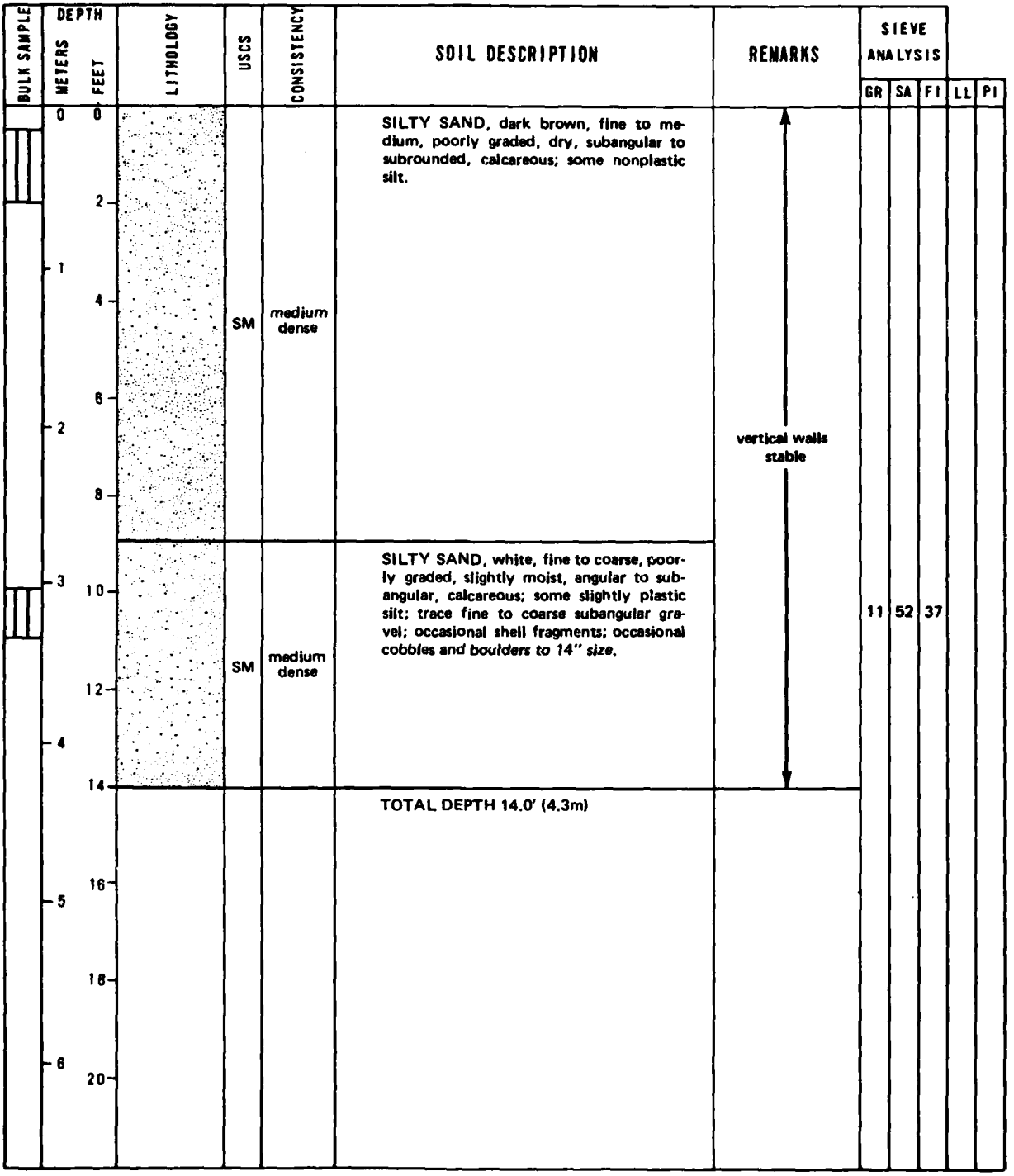
FIGURE II-7-8

E-TR-27-CV-II



TRENCH DETAILS

SURFACE ELEVATION : 6210' (1893m)
DATE EXCAVATED : 19 October 1979
SURFICIAL GEOLOGIC UNIT : A5y
TRENCH LENGTH : 16.0' (4.9m)
TRENCH ORIENTATION : E - W

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LOG OF TRENCH CV-T-6
CAVE VALLEY, NEVADA

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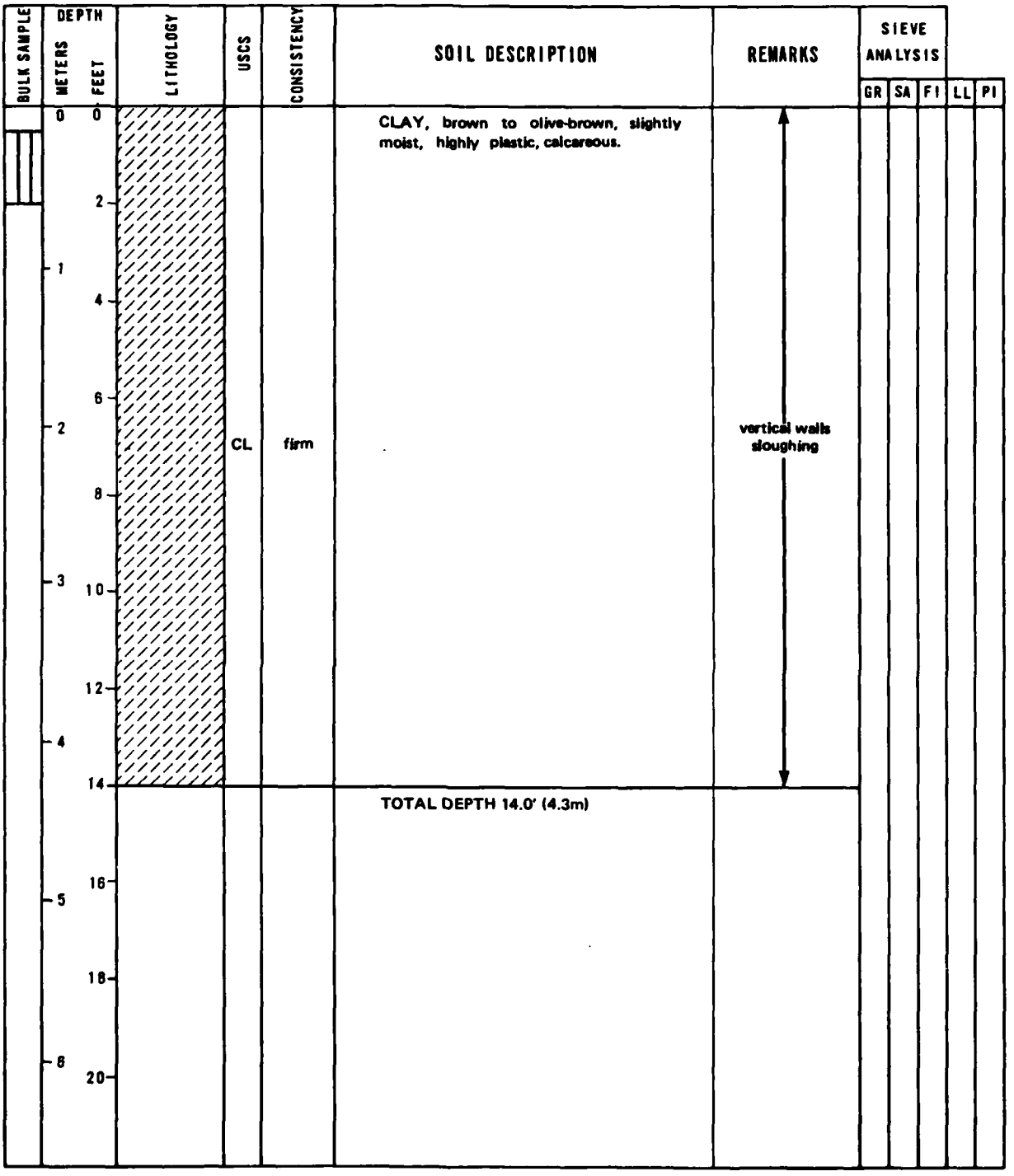
FIGURE II-7-6



TRENCH DETAILS

SURFACE ELEVATION : 5980' (1823m)
DATE EXCAVATED : 20 October 1979
SURFICIAL GEOLOGIC UNIT : A4o
TRENCH LENGTH : 16.0' (4.9m)
TRENCH ORIENTATION : NE - SW

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LOG OF TRENCH CV-T-7
CAVE VALLEY, NEVADA

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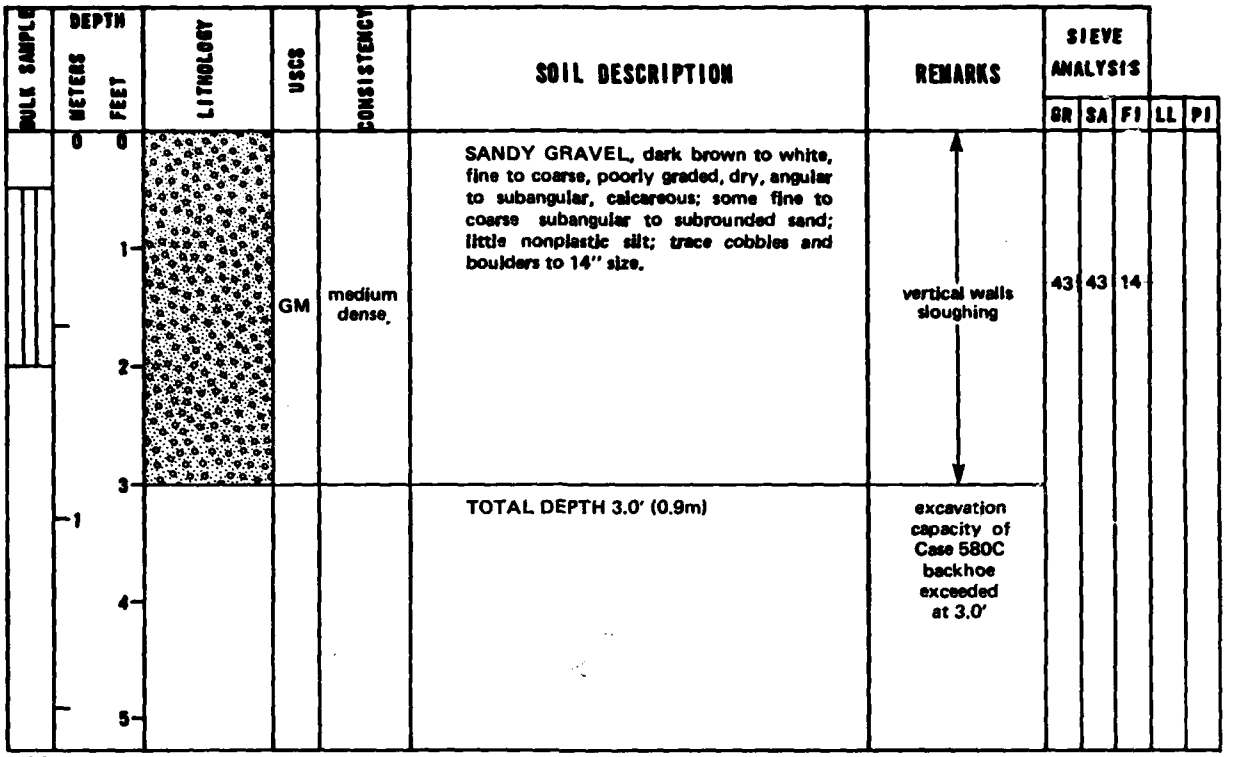
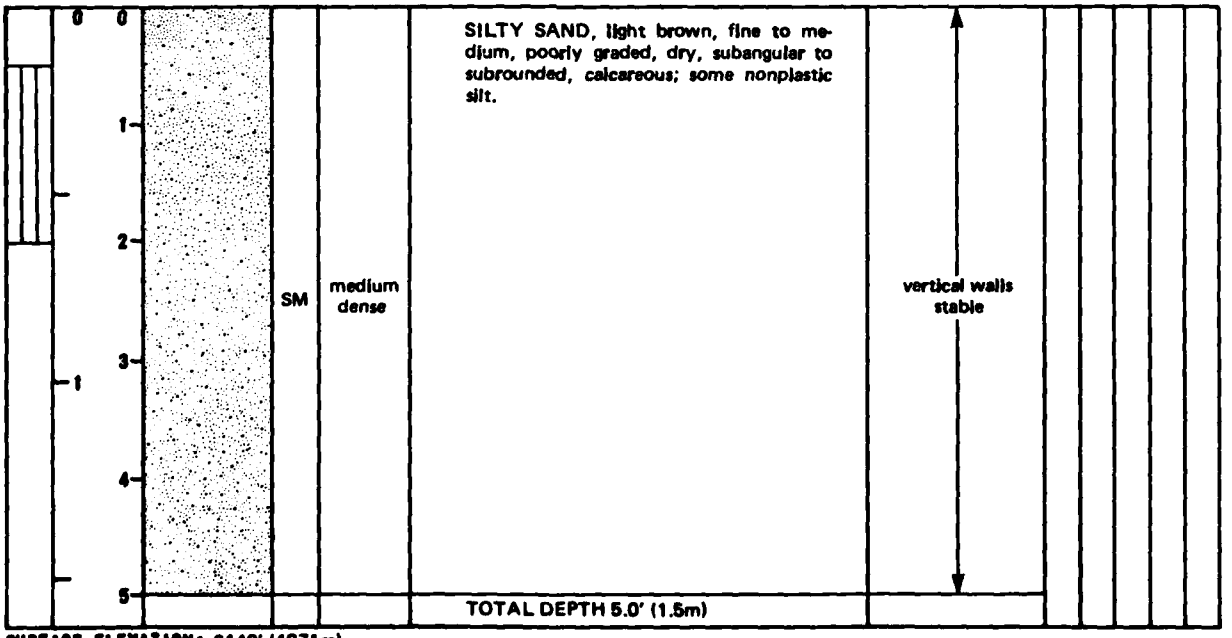
FIGURE II-7-7



SURFACE ELEVATION: 6640' (2024m)
SURFICIAL GEOLOGIC UNIT: A5i

LOG OF TEST PIT CV-P-1



SURFACE ELEVATION: 6140' (1871m)
SURFICIAL GEOLOGIC UNIT: A5y

LOG OF TEST PIT CV-P-2

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LOGS OF TEST PITS CV-P-1 AND CV-P-2
CAVE VALLEY, NEVADA

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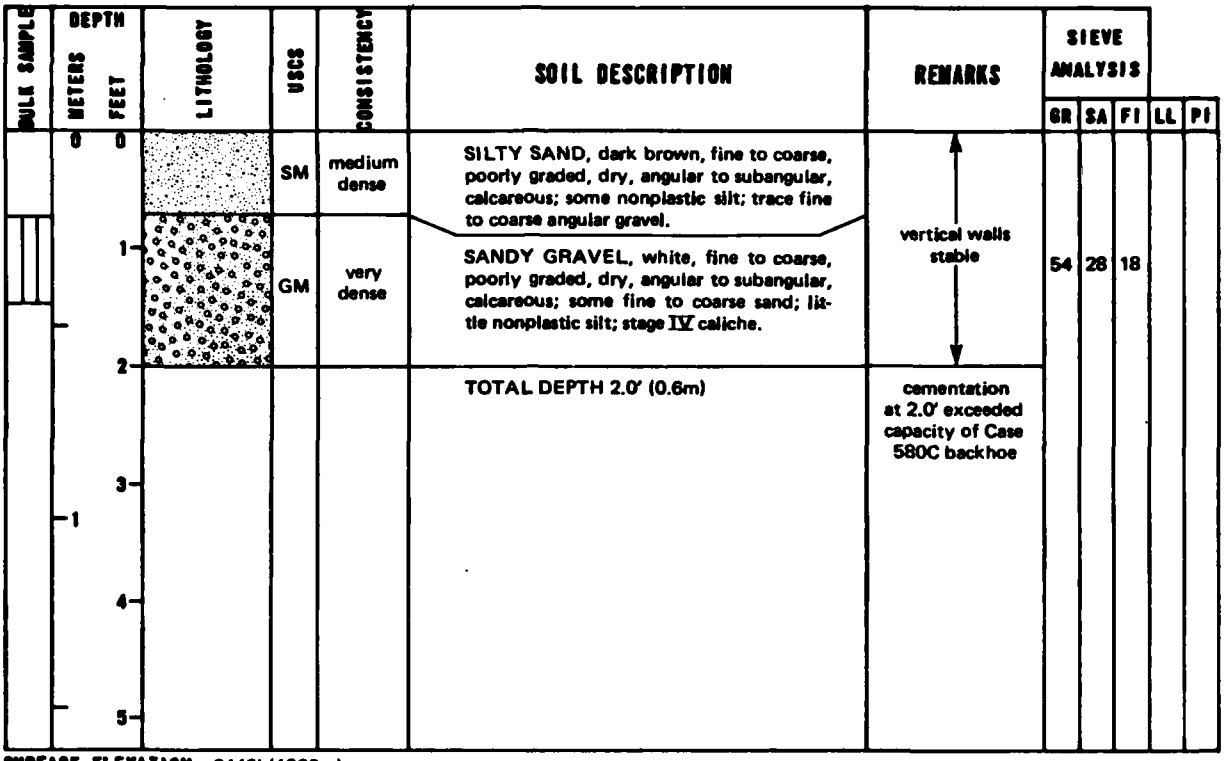
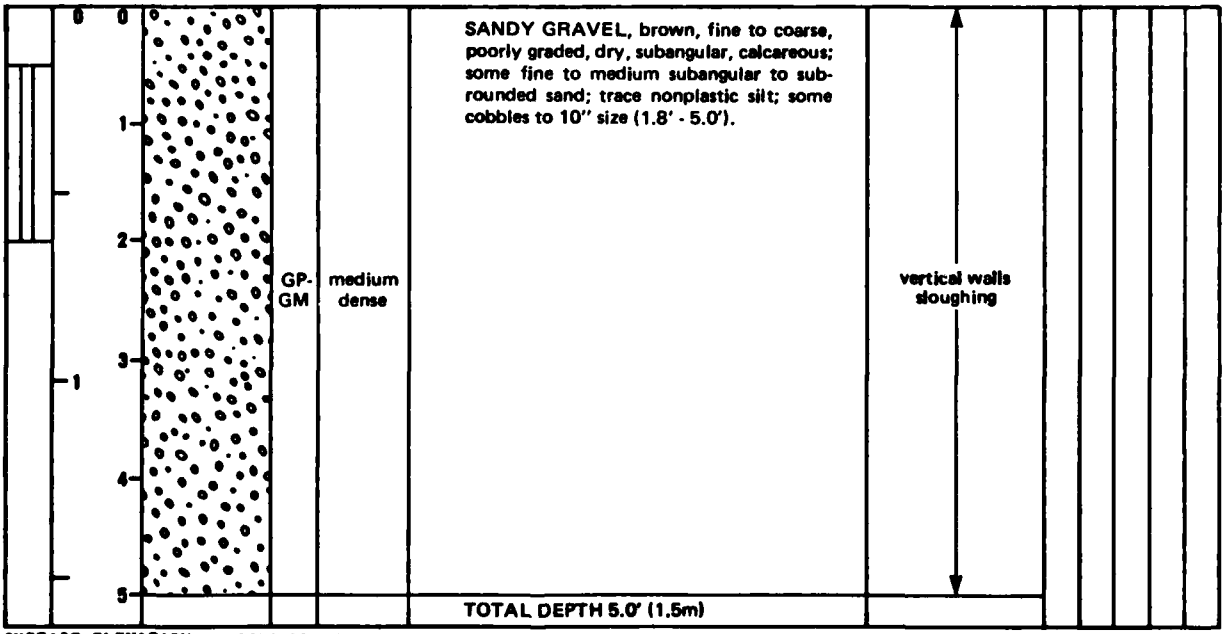
FIGURE II-7-8



SURFACE ELEVATION: 6440' (1963m)
SURFICIAL GEOLOGIC UNIT: A5i

LOG OF TEST PIT CV-P-3



SURFACE ELEVATION: 6190' (1887m)
SURFICIAL GEOLOGIC UNIT: A5i

LOG OF TEST PIT CV-P-4

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LOGS OF TEST PITS CV-P-3 AND CV-P-4 CAVE VALLEY, NEVADA

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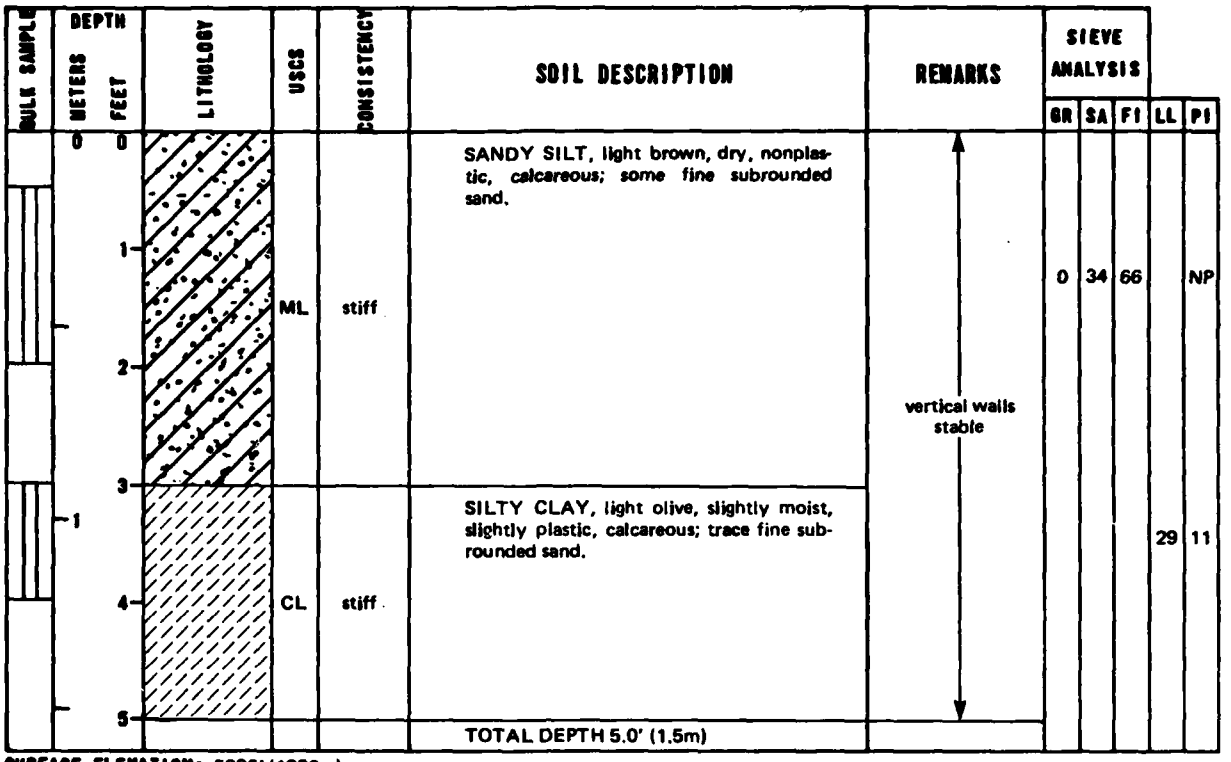
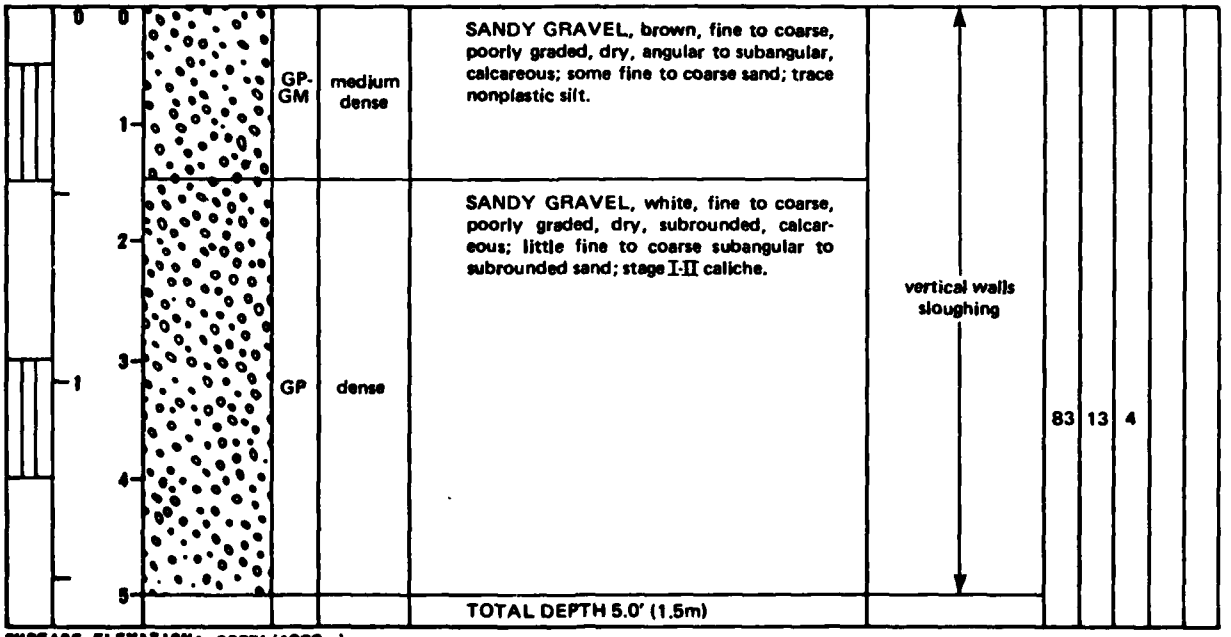
FIGURE II-7-9



SURFACE ELEVATION: 5980' (1823m)
SURFICIAL GEOLOGIC UNIT: A4o

LOG OF TEST PIT CV-P-5



SURFACE ELEVATION: 6325' (1928m)
SURFICIAL GEOLOGIC UNIT: A5i

LOG OF TEST PIT CV-P-6

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LOGS OF TEST PITS CV-P-5 AND CV-P-6 CAVE VALLEY, NEVADA

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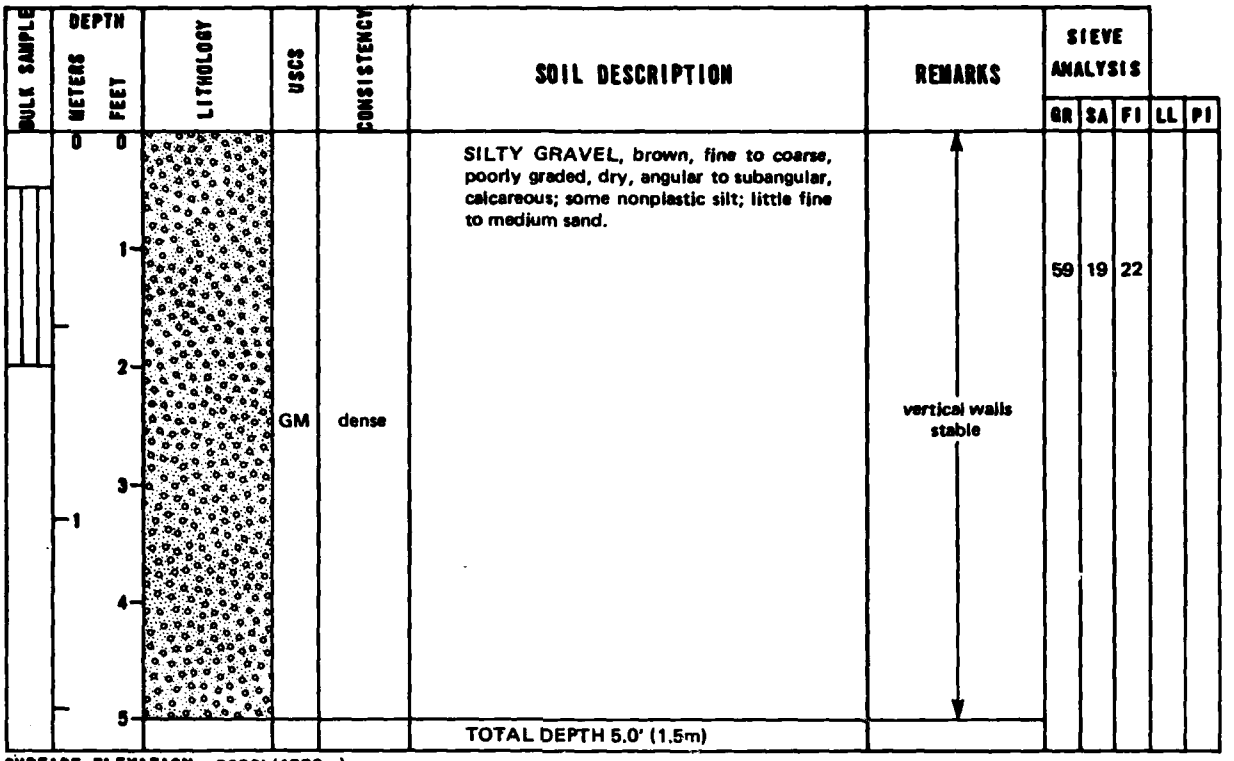
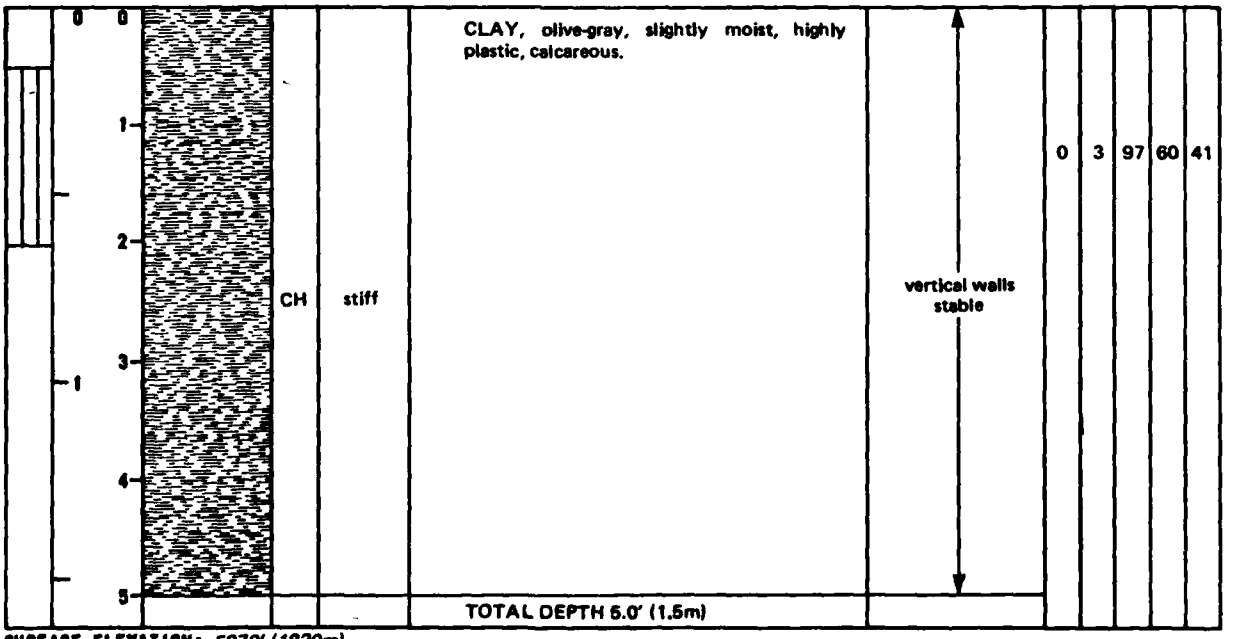
FIGURE II-7-10



SURFACE ELEVATION: 5990' (1826m)
SURFICIAL GEOLOGIC UNIT: A5y/A4o

LOG OF TEST PIT CV-P-7



SURFACE ELEVATION: 5970' (1820m)
SURFICIAL GEOLOGIC UNIT: A4o

LOG OF TEST PIT CV-P-8

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LOGS OF TEST PITS CV-P-7 AND CV-P-8 CAVE VALLEY, NEVADA

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FIGURE II-7-11

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		SM	medium dense	SILTY SAND, brown, fine to coarse, poorly graded, slightly moist, angular to subangular, calcareous; some nonplastic silt; trace fine gravel.	vertical walls stable	11	56	33		NP
	1			SM	medium dense	GRAVELLY SAND, light brown, fine to coarse, poorly graded, slightly moist, angular to subangular, calcareous; some fine to coarse gravel; little nonplastic silt.						
	1	3										
	5					TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 6030' (1838m)
SURFICIAL GEOLOGIC UNIT: A5y

LOG OF TEST PIT CV-P-9

	0	0										
	1											
	1	3										
	5											

SURFACE ELEVATION:
SURFICIAL GEOLOGIC UNIT:

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LOG OF TEST PIT CV-P-9
CAVE VALLEY, NEVADA

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FIGURE II-7-12

8.0 SURFICIAL SOIL SAMPLE LOGS

Explanation: Finalized logs of the surficial soil samples are presented in this section. Explanations of the column headings on the logs are as follows:

A. Activity Number - Surficial samples are identified as follows:

CV-CS-1
CV - abbreviation for the valley (e.g., CV - Cave)
CS - abbreviation for surficial sample
1 - number designation of activity

B. Ground Surface Elevation - Indicated elevations on the logs are estimated from topographic maps of the study area with an accuracy of half the contour interval.

C. Surficial Geologic Unit - Indicates the surficial geologic unit in which the activity is located.

D. Depth - Indicates depth interval for which soil description is given.

E. USCS - Unified Soil Classification System; see Table II-6-1 of Section 6.0, "Boring Logs", for details of USCS.

F. Soil Description - Soil is described based on field visual descriptions and/or laboratory test results. See Section 6.0, "Boring Logs", for procedures of soil description.

G. Sieve Analysis, LL and PI - These are from results of laboratory tests. See Section 6.0, "Boring Logs", for explanation.

ACTIVITY NUMBER	GROUND SURFACE ELEVATION, FEET (METERS)	SURFICIAL GEOLOGIC UNIT	DEPTH, FEET (METERS)	USCS	SOIL DESCRIPTION	SIEVE ANALYSIS				
						GR	SA	FI	LL	PI
CV-CS-3	5975 (1821)	A4o	0.0 - 2.0 (0.0 - 0.6)	CL	CLAY, olive-brown, medium plastic, calcareous.					
CV-CS-7	5980 (1823)	A4o	0.0 - 2.0 (0.0 - 0.6)	CL	SILTY CLAY, light brown, slightly plastic, calcareous.					
CV-CS-12	6005 (1830)	A4o	0.0 - 2.0 (0.0 - 0.6)	SM	SILTY SAND, light brown, fine to medium, poorly graded, subangular to subrounded; some nonplastic silt.					
CV-CS-14	6010 (1832)	A4o	0.0 - 2.0 (0.0 - 0.6)	GP-GM	SANDY GRAVEL, white to gray, fine to coarse, poorly graded, subangular to subrounded, calcareous; some fine to coarse sand; trace nonplastic silt.	48	45	7		
CV-CS-20	6435 (1961)	A5i	0.0 - 2.0 (0.0 - 0.6)	SM	SILTY SAND, brown, fine to coarse, poorly graded, angular to subangular, calcareous; little nonplastic silt; trace fine to coarse angular gravel.					

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LOGS OF SURFICIAL SOIL SAMPLES
CAVE VALLEY, NEVADA

26 OCT 81

FIGURE II-6-1

9.0 CONE PENETROMETER TEST RESULTS

Explanation: The figures in this section show the results of the cone penetrometer tests. The terms used in the figures are defined below.

A. Depth - Corresponds to depth below ground surface.

B. Friction Resistance - The resistance to penetration developed by the friction sleeve, equal to the vertical force applied to the sleeve divided by its surface area. This resistance is the sum of friction and adhesion.

C. Cone Resistance - The resistance to penetration developed by the cone, equal to the vertical force applied to the cone divided by its horizontally projected area.

D. Friction Ratio - The ratio of friction resistance to cone resistance.

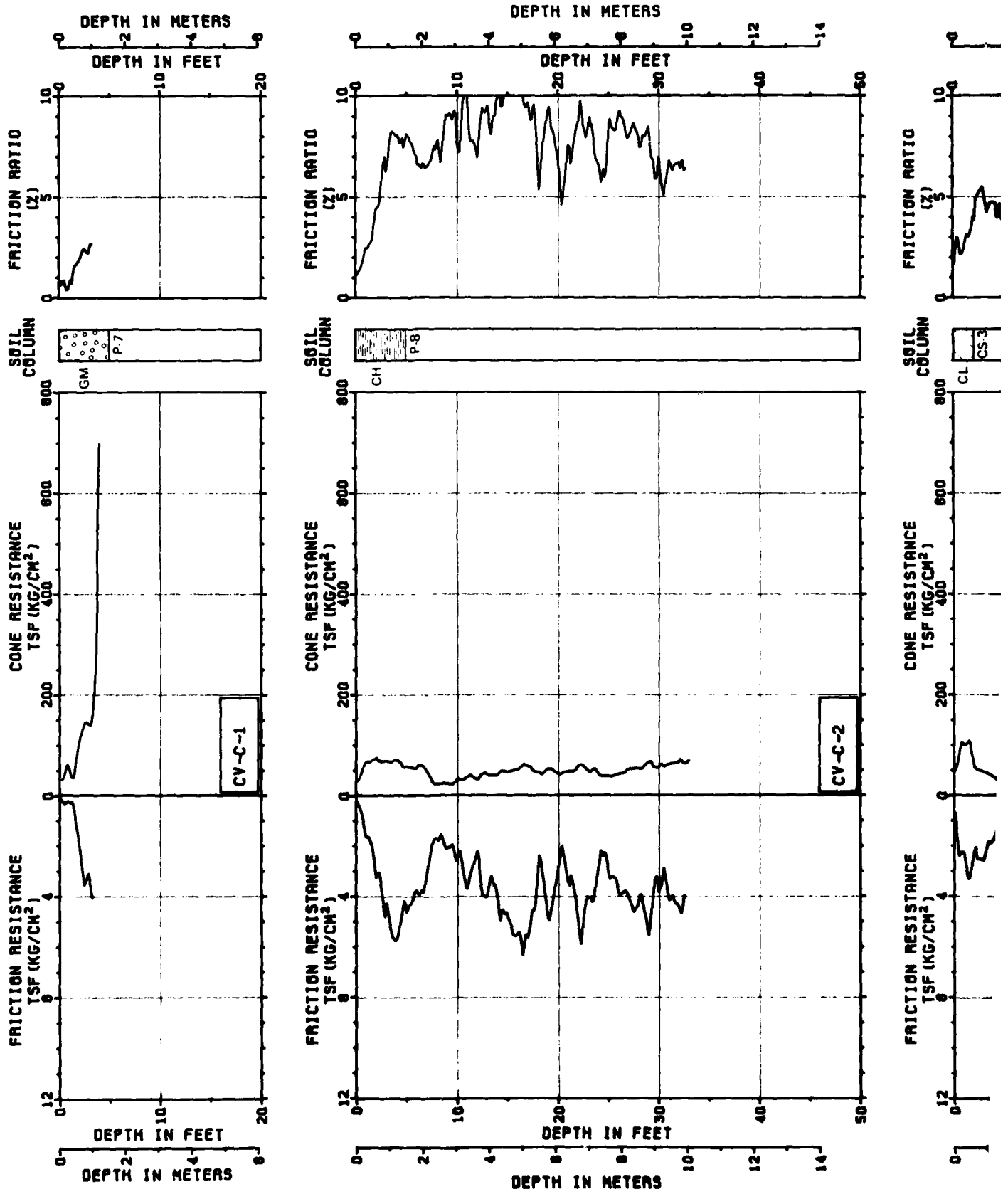
E. Designation - Each cone penetrometer test is identified by a number: for example C-1.

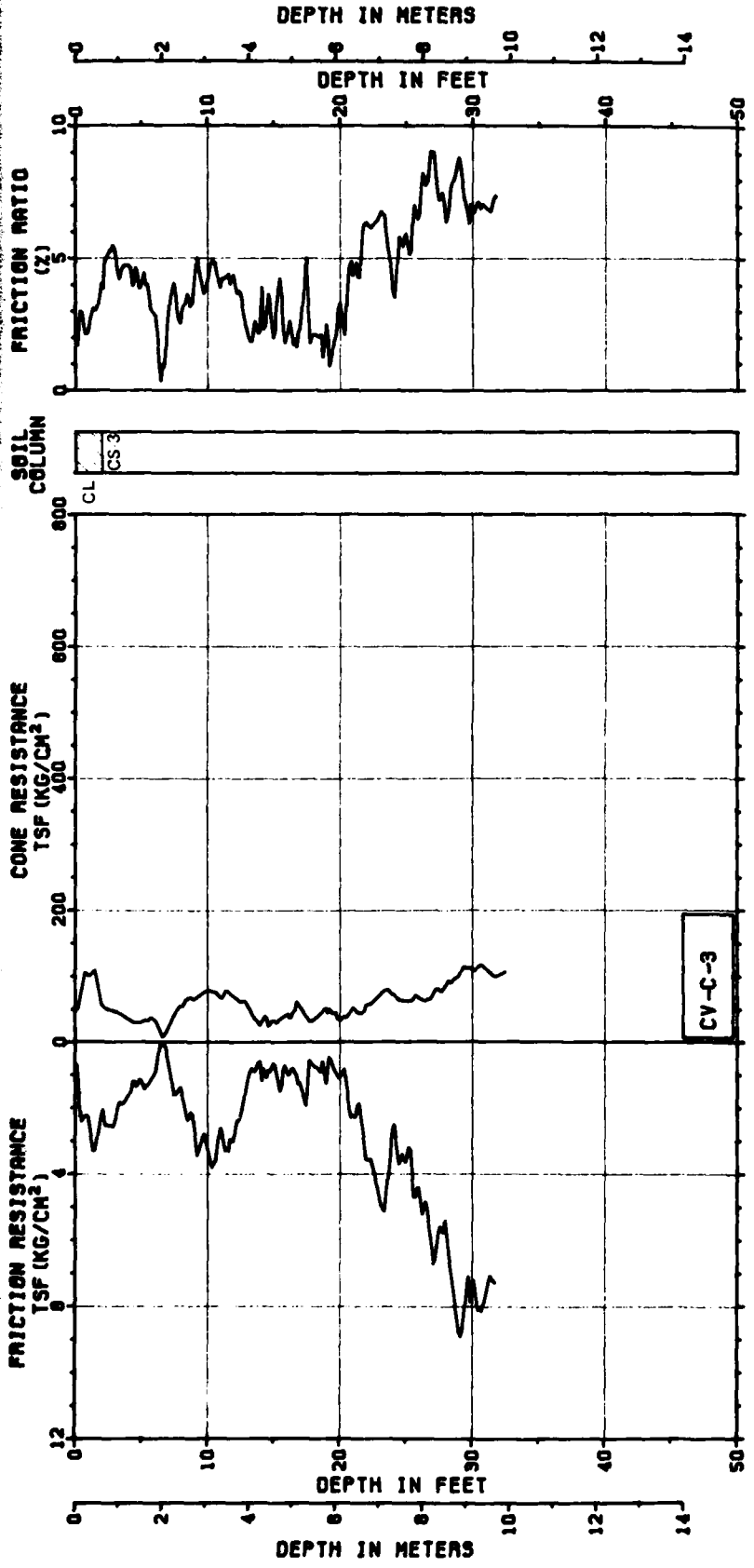
C - abbreviation for the CPT
1 - number designation of the test

F. Surface Elevation - Indicated elevations on the figures are estimated from topographic maps of the study area and are accurate within one-half the contour interval.

G. Surficial Geologic Unit - Indicates the surficial geologic unit in which the test was located.

H. Soil Column - A graphical presentation of the soil type versus depth at each cone penetrometer test location. The USCS symbol for each different soil type is listed immediately to the left of the soil column. Immediately below the soil column, the activity number for the corresponding boring, trench, or test pit, or surficial soil sample at each CPT location is given.


DEPTH IN METERS
DEPTH IN FEET
FRICTION RATIO (%)
SOIL COLUMN
GM
P-7
CH
P-8
CL
CS-3
CONE RESISTANCE TSF (KG/CM²)
FRICTION RESISTANCE TSF (KG/CM²)
CV-C-1
CV-C-2



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CONE PENETROMETER TEST RESULTS
CAVE VALLEY, NEVADA
PAGE 1 OF 6

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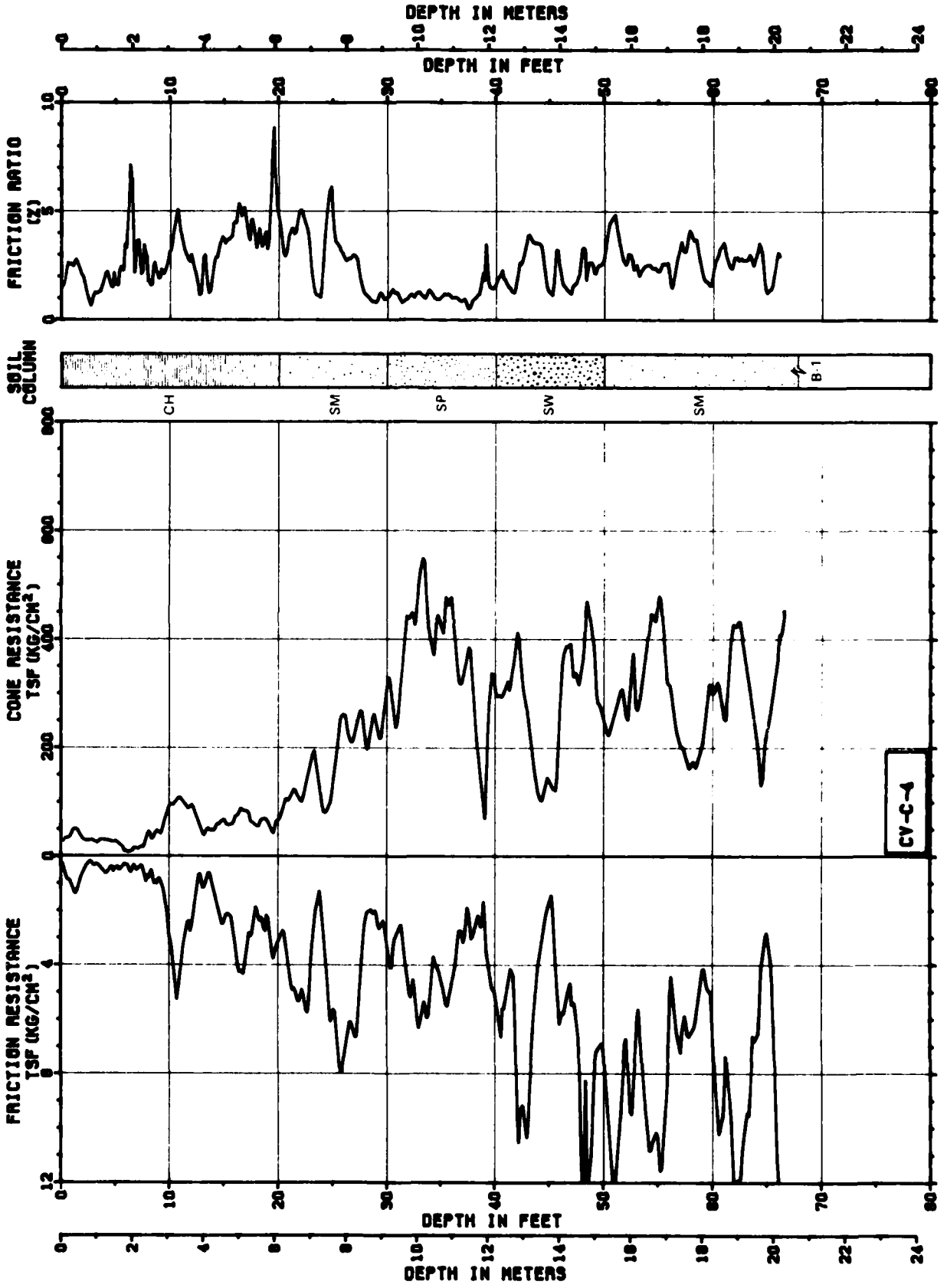
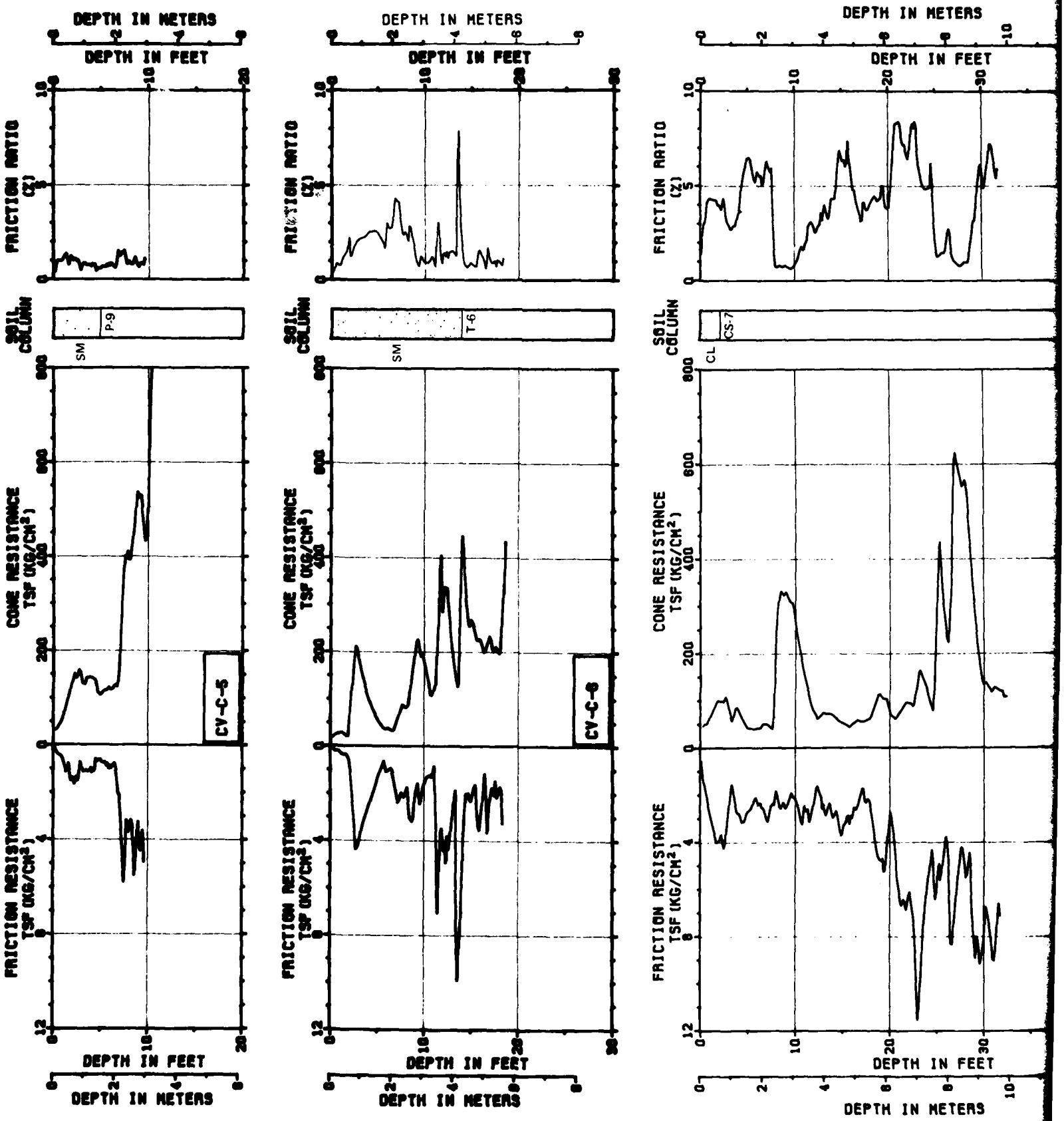
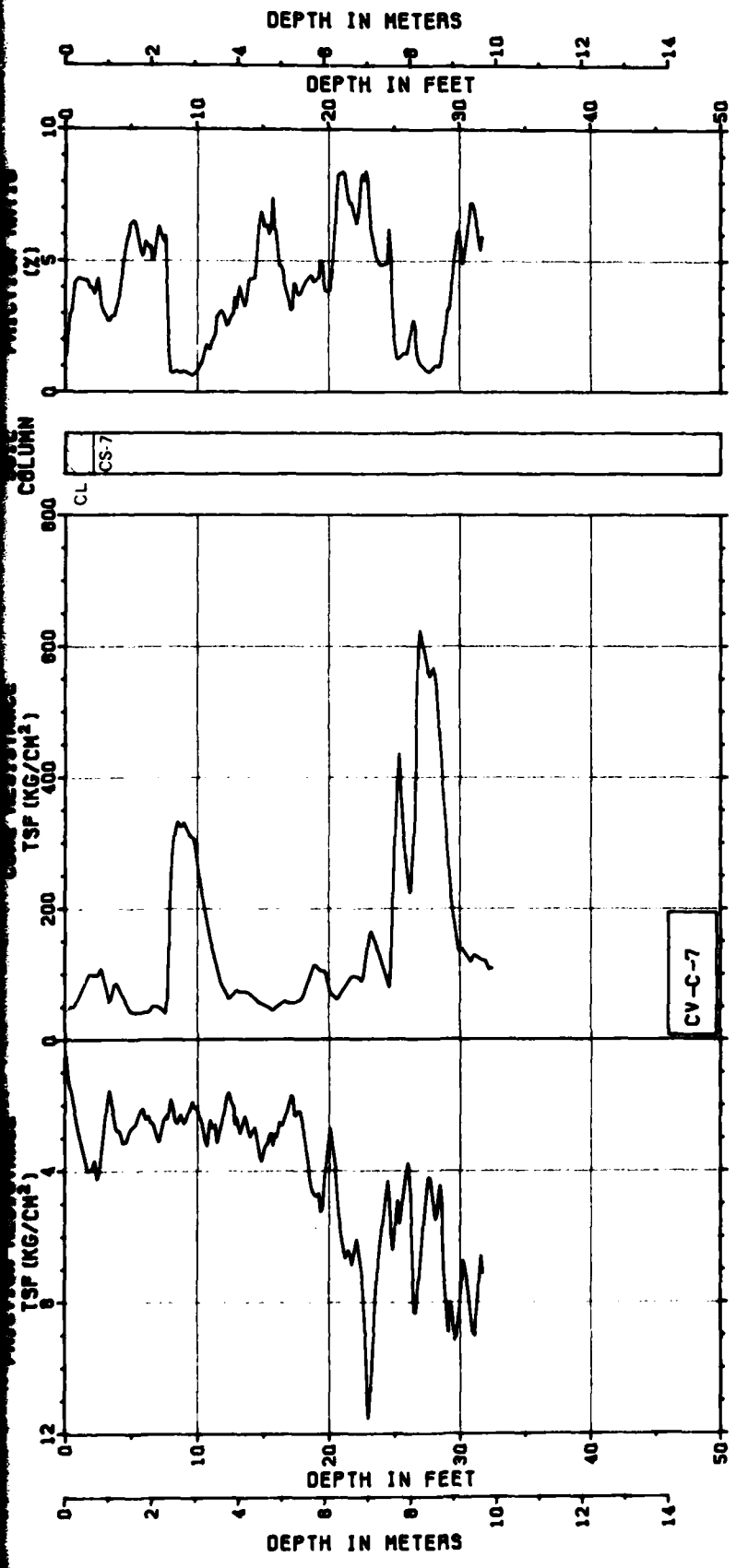
FIGURE II-9-1


DEPTH IN METERS
DEPTH IN FEET
FRICTION RATIO (%)
SOIL COLUMN
CH
SM
SP
SW
SM
B-1
CONE RESISTANCE TSF (KG/CM²)
FRICTION RESISTANCE TSF (KG/CM²)
CV-C-4
DEPTH IN FEET
DEPTH IN METERS


DEPTH IN METERS
DEPTH IN FEET
FRICTION RATIO (%)
SOIL COLUMN
SM
P-9
CONE RESISTANCE TSF (KG/CM²)
CV-C-5
FRICTION RESISTANCE TSF (KG/CM²)
DEPTH IN FEET
DEPTH IN METERS
DEPTH IN METERS
DEPTH IN FEET
FRICTION RATIO (%)
SOIL COLUMN
SM
T-6
CONE RESISTANCE TSF (KG/CM²)
CV-C-6
FRICTION RESISTANCE TSF (KG/CM²)
DEPTH IN FEET
DEPTH IN METERS
DEPTH IN METERS
DEPTH IN FEET
FRICTION RATIO (%)
SOIL COLUMN
CL
CS-7
CONE RESISTANCE TSF (KG/CM²)
FRICTION RESISTANCE TSF (KG/CM²)
DEPTH IN FEET
DEPTH IN METERS



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CONE PENETROMETER TEST RESULTS
CAVE VALLEY, NEVADA
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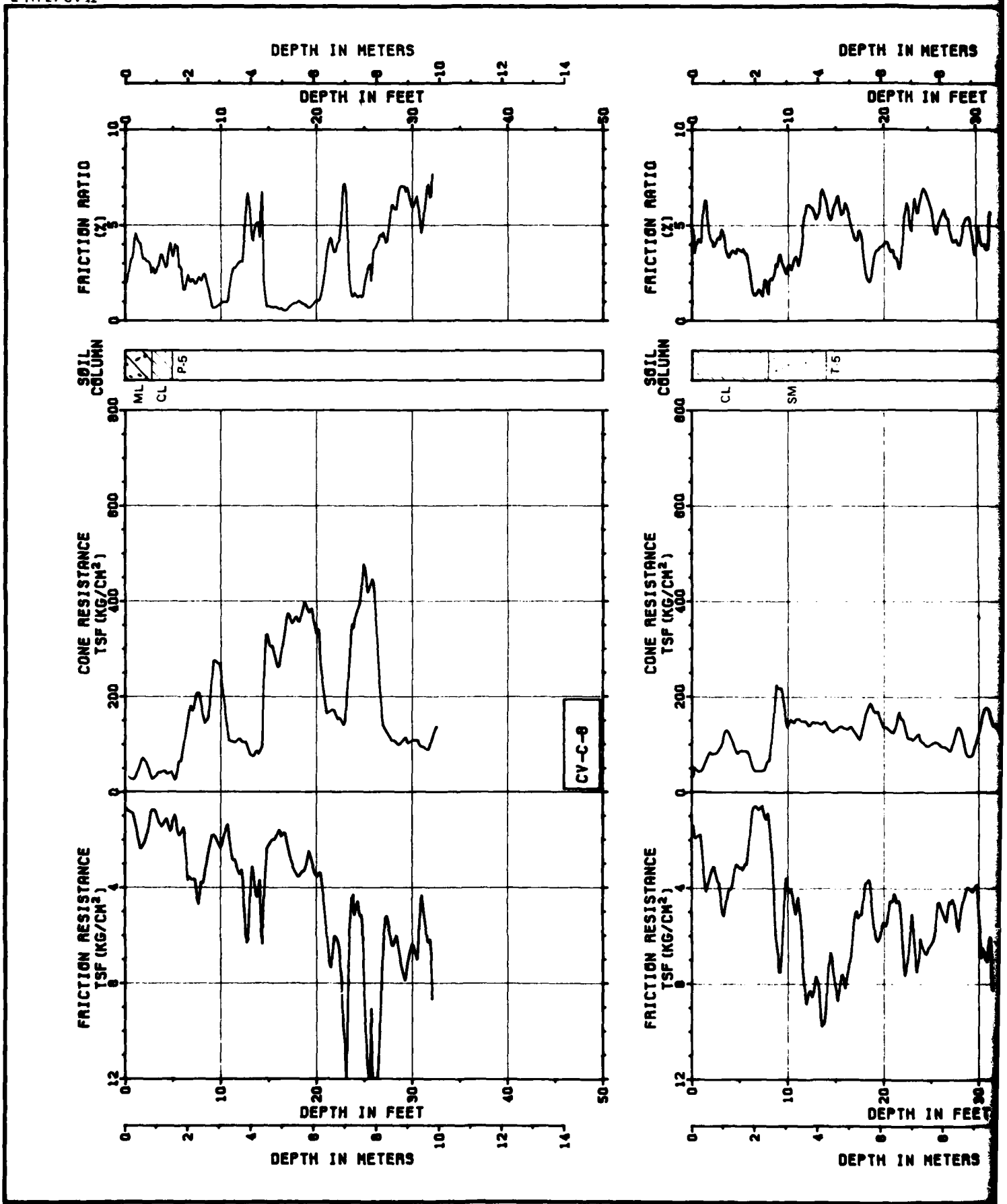
FIGURE D-9-1


DEPTH IN METERS
DEPTH IN FEET
FRICTION RATIO (%)
SOIL COLUMN
ML
CL
P-5
CONE RESISTANCE TSF (KG/CM²)
FRICTION RESISTANCE TSF (KG/CM²)
CV-C-8
DEPTH IN METERS
DEPTH IN FEET
FRICTION RATIO (%)
SOIL COLUMN
CL
SM
T-5
CONE RESISTANCE TSF (KG/CM²)
FRICTION RESISTANCE TSF (KG/CM²)
DEPTH IN FEET
DEPTH IN METERS

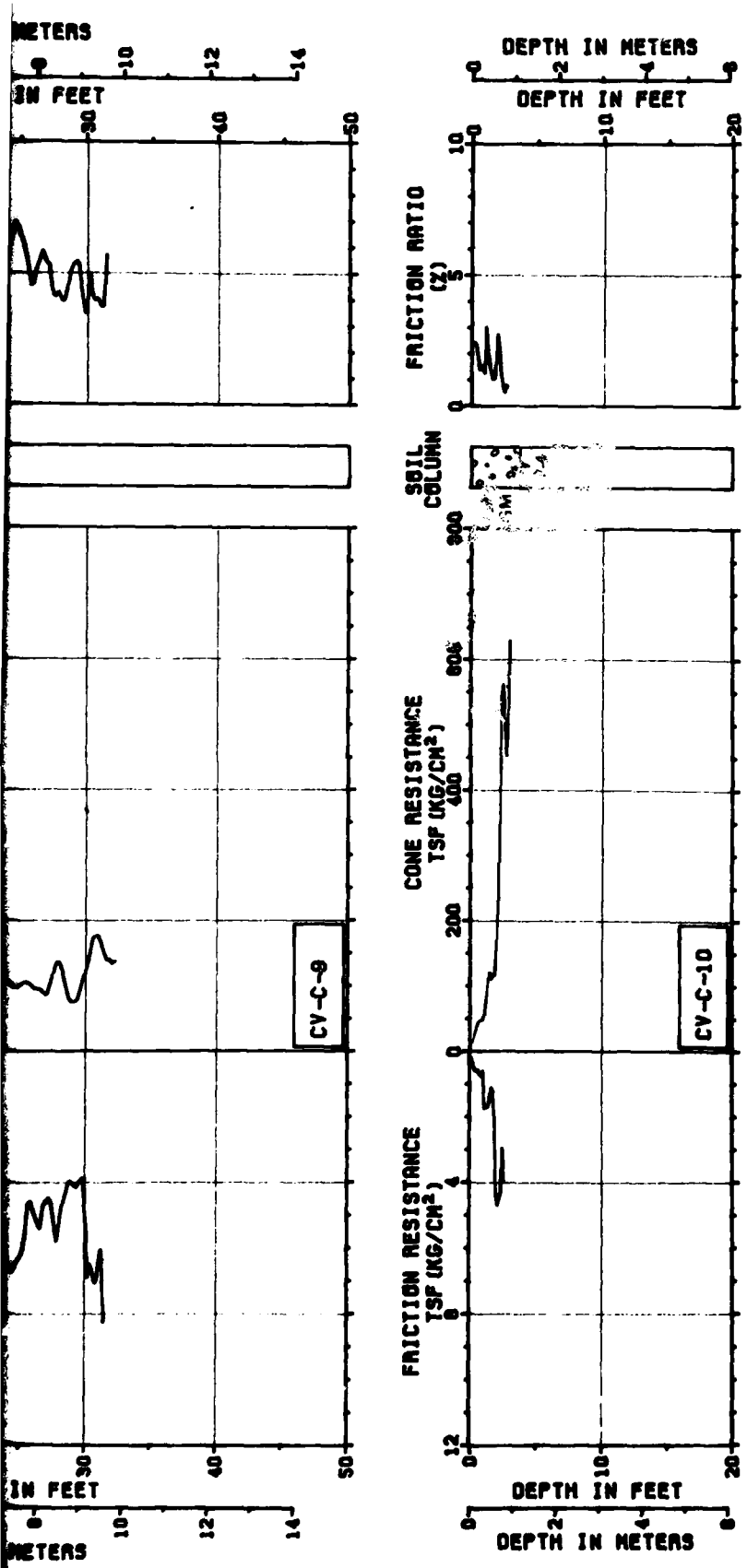


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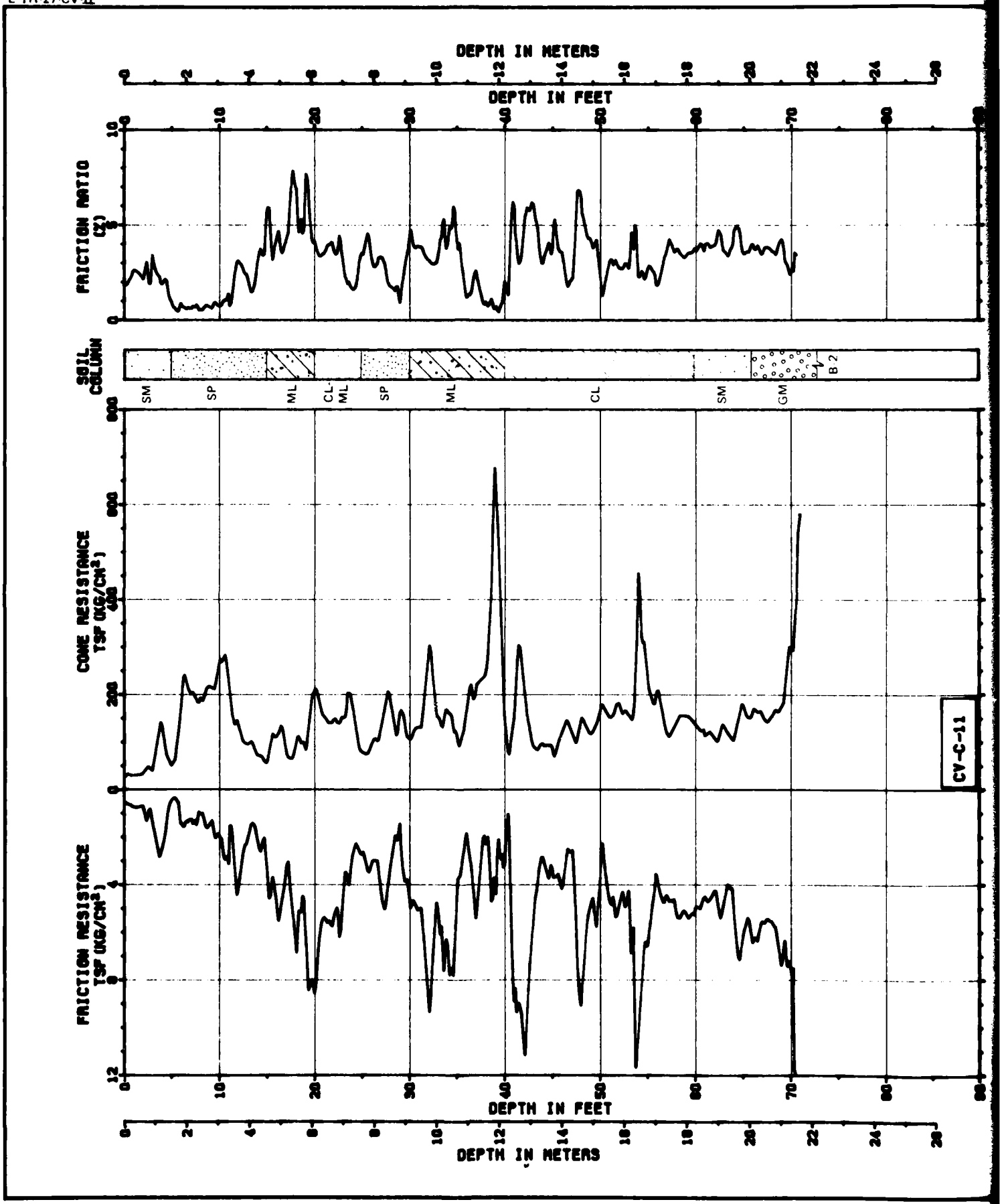
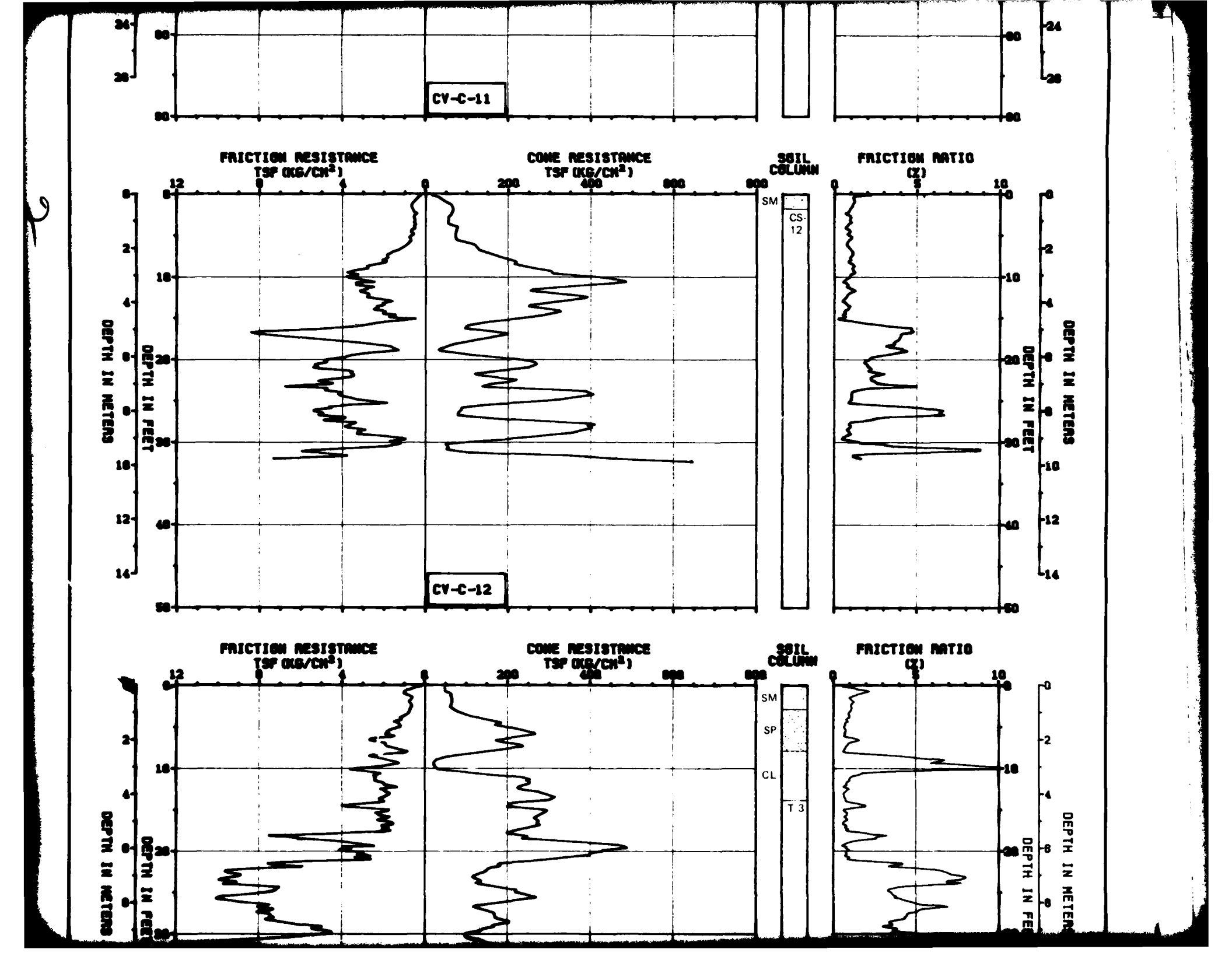
FIGURE II-9-1


DEPTH IN METERS
DEPTH IN FEET
FRICTION RATIO (%)
SOIL COLUMN
SM
SP
ML
CL-ML
SP
ML
CL
SM
GM
B 2
CONE RESISTANCE TSF (KG/CM²)
FRICTION RESISTANCE TSF (KG/CM²)
CV-C-11
DEPTH IN FEET
DEPTH IN METERS


CV-C-11
FRICTION RESISTANCE
TSF (KG/CM²)
CONE RESISTANCE
TSF (KG/CM²)
SOIL COLUMN
FRICTION RATIO
(%)
SM
CS-12
DEPTH IN METERS
DEPTH IN FEET
CV-C-12
FRICTION RESISTANCE
TSF (KG/CM²)
CONE RESISTANCE
TSF (KG/CM²)
SOIL COLUMN
FRICTION RATIO
(%)
SM
SP
CL
T 3
DEPTH IN METERS
DEPTH IN FEET

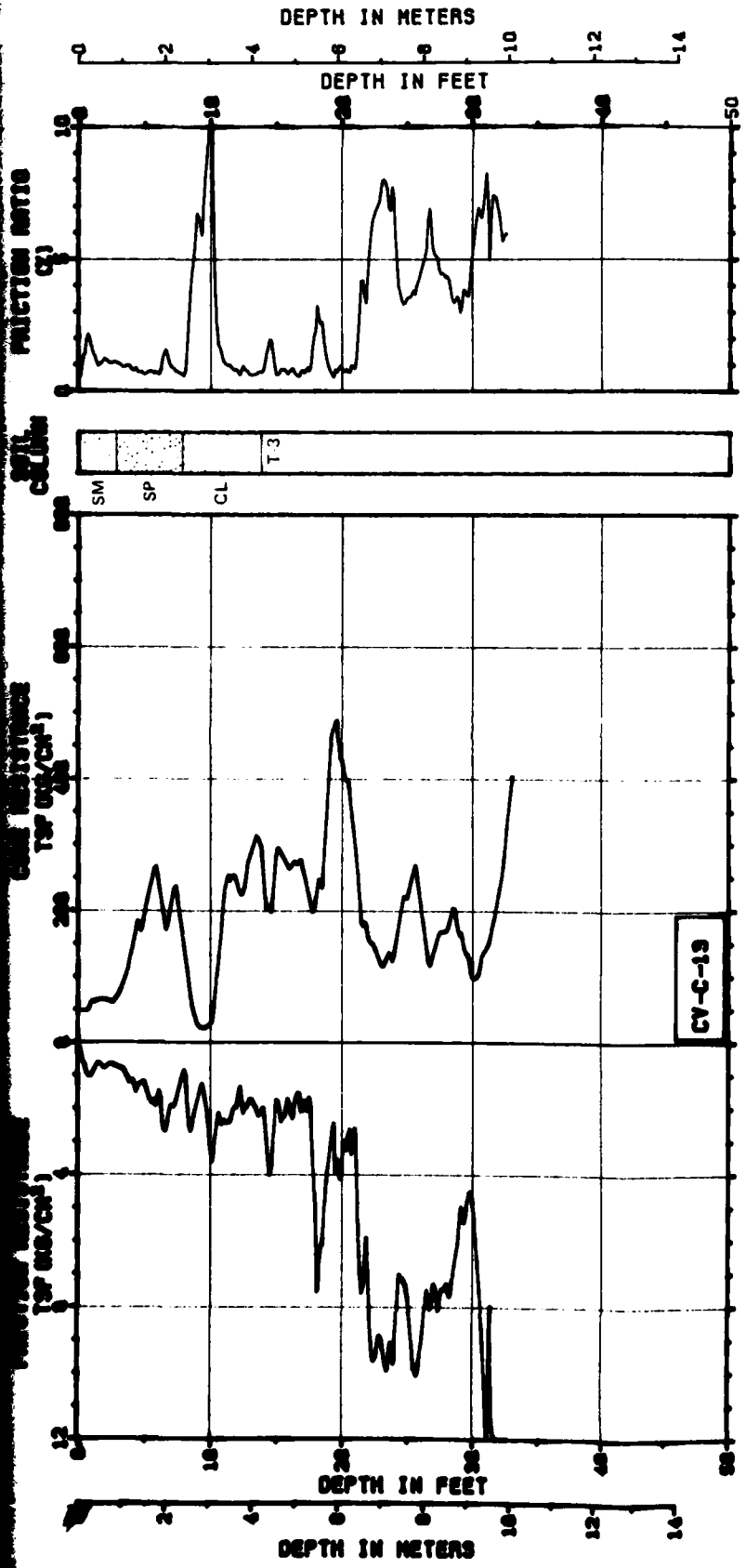


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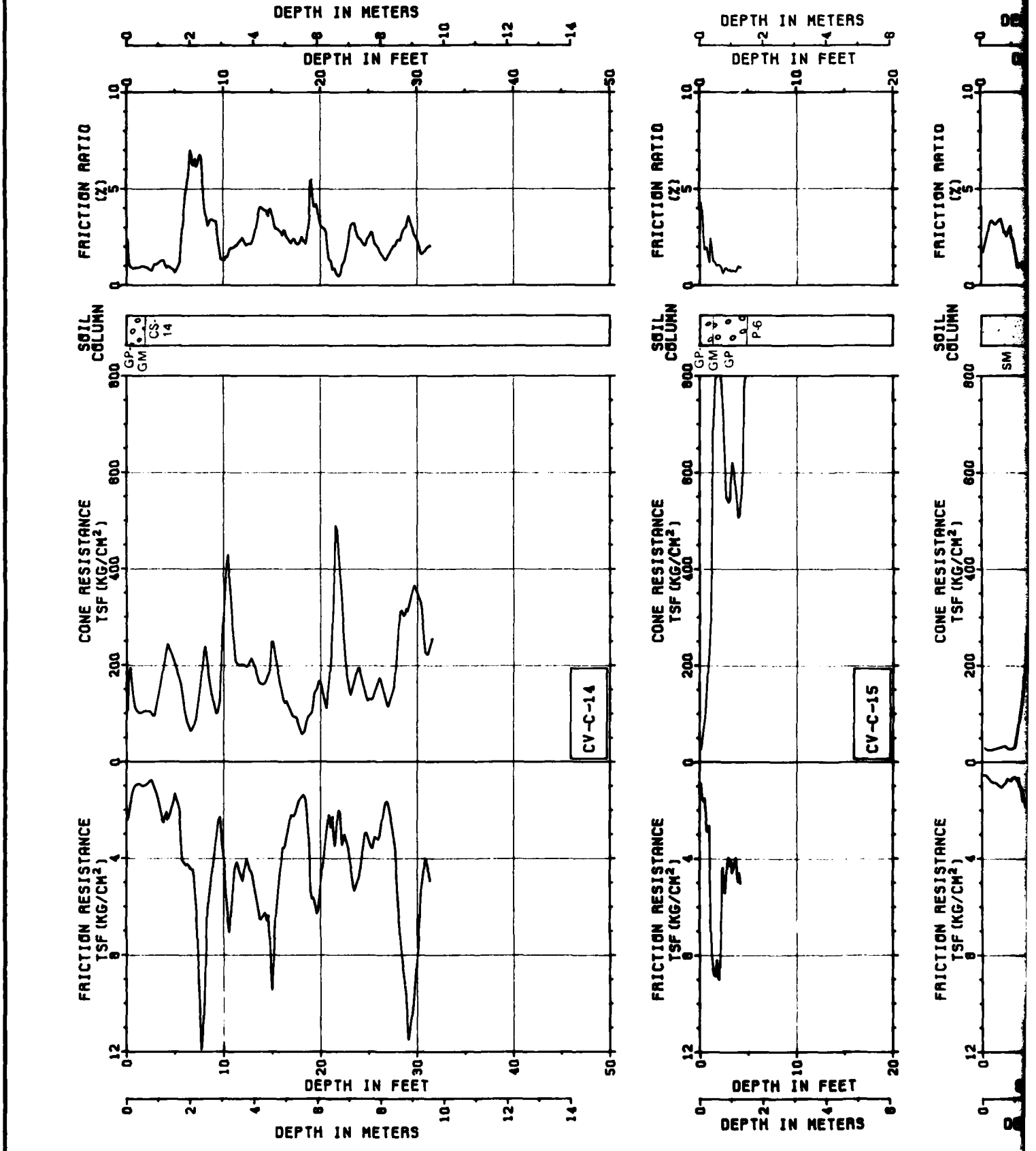
FIGURE D-9.1


DEPTH IN METERS
DEPTH IN FEET
FRICTION RATIO (%)
SOIL COLUMN
GP
GM
CS-14
CONE RESISTANCE TSF (KG/CM²)
FRICTION RESISTANCE TSF (KG/CM²)
CV-C-14
DEPTH IN METERS
DEPTH IN FEET
FRICTION RATIO (%)
SOIL COLUMN
GP
GM
GP
P-6
CONE RESISTANCE TSF (KG/CM²)
FRICTION RESISTANCE TSF (KG/CM²)
CV-C-15
DEPTH IN FEET
DEPTH IN METERS
FRICTION RATIO (%)
SOIL COLUMN
SM
CONE RESISTANCE TSF (KG/CM²)
FRICTION RESISTANCE TSF (KG/CM²)

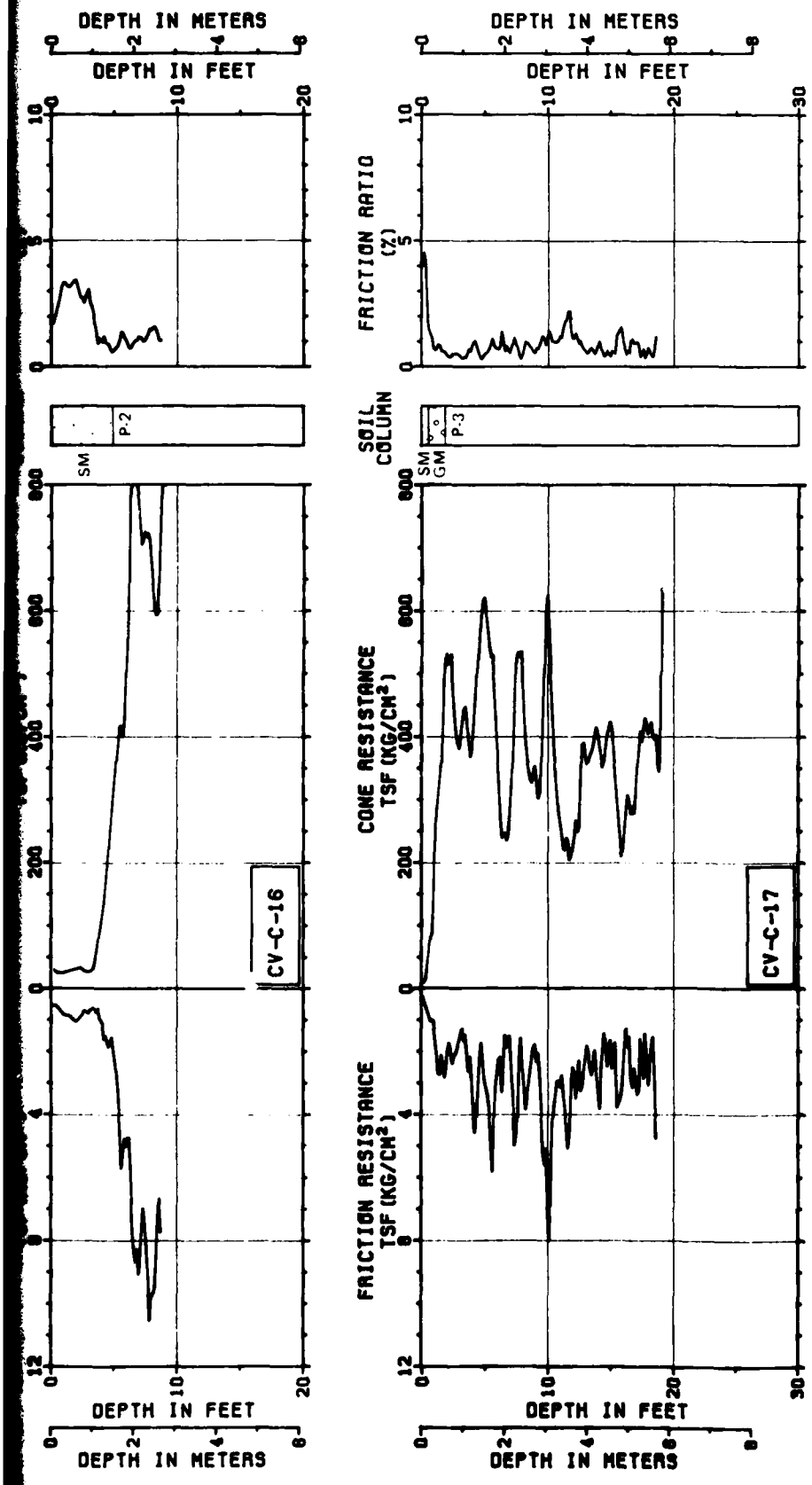


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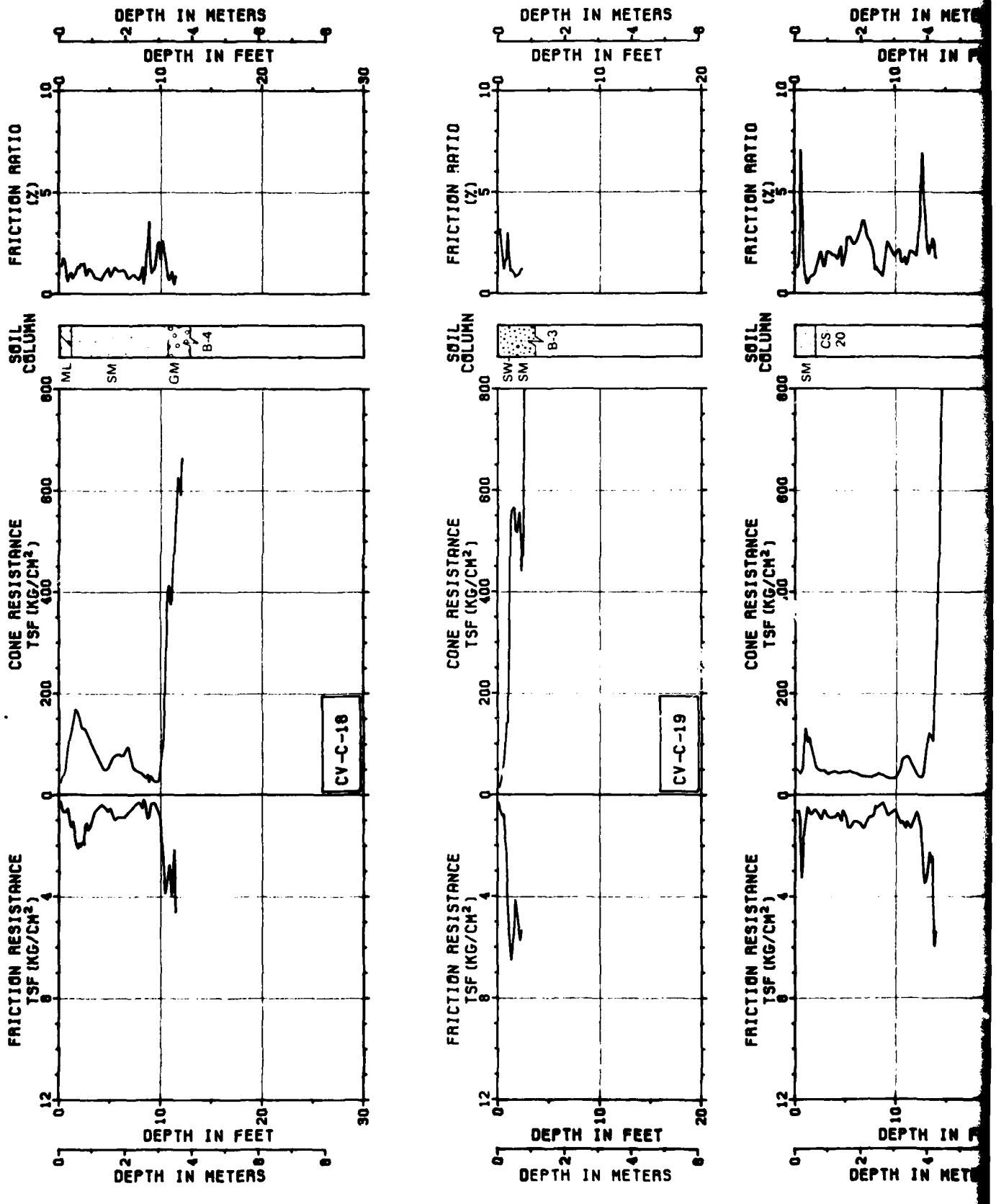
FIGURE II-B 1


DEPTH IN METERS
DEPTH IN FEET
FRICTION RATIO (%)
SOIL COLUMN
ML
SM
GM
B-4
CONE RESISTANCE TSF (KG/CM²)
CV-C-18
FRICTION RESISTANCE TSF (KG/CM²)
DEPTH IN FEET
DEPTH IN METERS
DEPTH IN METERS
DEPTH IN FEET
FRICTION RATIO (%)
SOIL COLUMN
SW
SM
B-3
CONE RESISTANCE TSF (KG/CM²)
CV-C-19
FRICTION RESISTANCE TSF (KG/CM²)
DEPTH IN FEET
DEPTH IN METERS
DEPTH IN METE
DEPTH IN F
FRICTION RATIO (%)
SOIL COLUMN
SM
CS
20
CONE RESISTANCE TSF (KG/CM²)
FRICTION RESISTANCE TSF (KG/CM²)
DEPTH IN F
DEPTH IN METE

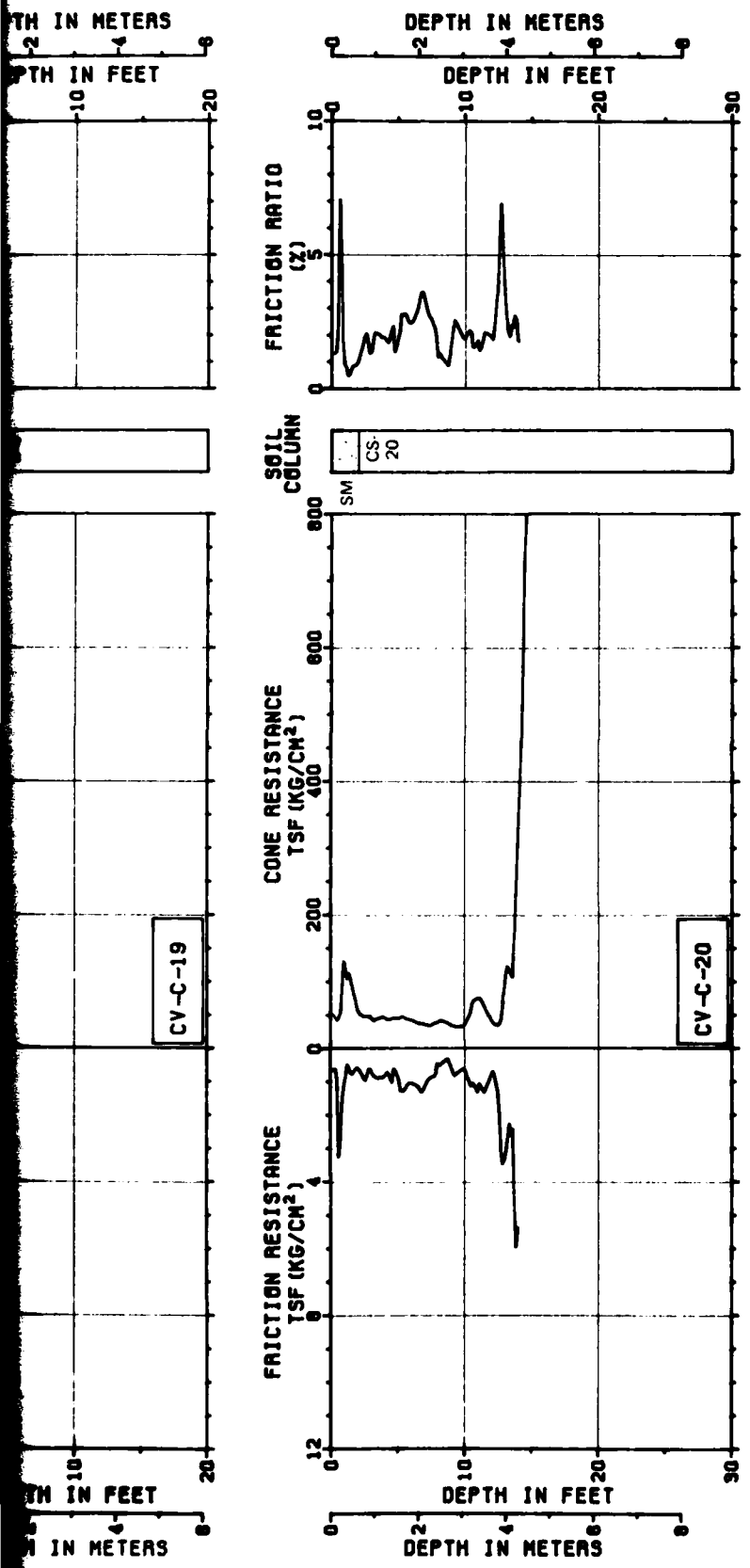


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FIGURE II-9 1

10.0 LABORATORY TEST RESULTS

Explanation: Table II-10-1 contains a summary of laboratory test results. This table contains results of sieve analysis; plasticity data; in-situ dry unit weight, moisture content, degree of saturation, and void ratio for drive and Pitcher samples; results of compaction tests; and specific gravity of solids. Other tests such as triaxial compression, unconfined compression, direct shear, consolidation, chemical, and California Bearing Ratio (CBR) are indicated on the table. Tables II-10-2 through II-10-6 and Figures II-10-1 through II-10-3 present results of triaxial compression, unconfined compression, direct shear, consolidation, chemical, and CBR tests.

All tests were performed in general accordance with the American Society for Testing and Materials (ASTM) procedures. The following list presents the ASTM designations for the tests performed during the investigation.

Type of Test	ASTM Designations
Particle Size Analysis	D 422-63
Liquid Limit	D 423-66
Plastic Limit	D 424-59
Unit Weight	D 2937-71
Moisture Content	D 2216-71
Compaction	D 1557-70
Specific Gravity of Solids	D 854-58
Triaxial	D 2850-70
Unconfined Compression	D 2166-66
Direct Shear	D 3080-72
Consolidation	D 2435-70
Test for Alkalinity (pH)	D 1067-70
Water Soluble Sodium	D 1428-64
Water Soluble Chloride	D 512-67
Water Soluble Sulphate	D 516-68
Water Soluble Calcium	D 511-72
Calcium Carbonate	D 1126-67
California Bearing Ratio (CBR)	D 1883-73

Explanation for the tables and figures presented in this section are as follows:

A. Activity Number - Boring, trench, test pit, or surficial sample designation.

B. Sample Number - Prefix indicates the type of sample; explanation is at the bottom of the table.

C. Sample Interval - This is the depth range measured from ground surface over which the sample was obtained.

D. Percent Finer by Weight - Presents the results of laboratory particle size analysis (ASTM D 422-63) performed on representative soil samples at the depth indicated. The numbers represent the percent (of dry weight) of the total sample weight passing through each sieve size indicated.

E. Atterberg Limits (ASTM D 423-66 and D 424-59)

LL - Liquid Limit, the water content (as percent of soil dry weight) corresponding to the arbitrary limit between the liquid and plastic states of consistency of a soil (ASTM D 423-66).

PL - Plastic Limit, the water content corresponding to an arbitrary limit between the plastic and the semisolid state of consistency of a soil (ASTM D 424-59).

PI - Plasticity Index, numerical difference between the liquid limit (LL) and the plastic limit (PL) indicating the range of moisture content within which a soil-water mixture is plastic.

NP - Nonplastic.

F. USCS - Unified Soil Classification System symbols are given here; see Table II-6-1 in Section 6.0, "Boring Logs", for complete details of USCS system.

G. In Situ - Presents results of tests on drive and Pitcher samples.

Dry Unit Weight - indicates dry unit weight of soil determined as per ASTM D 2937-71.

Moisture Content - weight of water reported in percent of dry weight of soil sample (ASTM D 2216-71).

Saturation - the degree of saturation in a soil sample is defined as the ratio (in percent) of the volume of water to the volume of all voids in the soil.

Void Ratio - the numerical ratio of the volume of voids to the volume of solids in a soil specimen.

H. Compacted - Indicates results of laboratory maximum dry density and optimum moisture content test per ASTM D 1557-70.

I. Specific Gravity of Solids (ASTM D 854-58) - Indicates the ratio of 1) the weight in air of a given volume of soil solids at a stated temperature, to 2) the weight in air of an equal volume of distilled water at a stated temperature.

J. Triaxial - The triaxial compression tests were performed in accordance with the procedures of ASTM D 2850-70. The following explanations and definitions apply.

Triaxial Compression Test - a cylindrical specimen of soil is surrounded by a fluid in a pressure chamber and subjected to an isotropic pressure. An additional compressive load is then applied, directed along the axis of the specimen called the axial load.

Consolidated-Drained (CD) Test - a triaxial compression test in which the soil was first consolidated under an all-around confining stress (test chamber pressure) and was then compressed (and hence sheared) by increasing the vertical stress. "Drained" indicates that excess pore water pressure generated by strains are permitted to dissipate by

the free movement of pore water during consolidation and compression.

Consolidated-Undrained (CU) Test - a triaxial compression test in which essentially complete consolidation under the confining (chamber) pressure is followed by a shear test at constant water content.

Confining Pressure (σ_3) - the isotropic chamber pressure applied to the soil specimen during consolidation and compression.

Maximum Deviator Stress ($\sigma_1-\sigma_3$) - the difference between the major and minor principal stresses in the specimen at failure. The major principal stress on the specimen is equal to the unit axial load plus the chamber pressure, and the minor principal stress on the specimen is equal to the chamber pressure.

Strain Rate - axial strain, ε, at a given stress level is defined as the ratio of the change in length (ΔL) of the specimen to the original length of the specimen (L_o). The rate of strain was controlled during the test so that this ratio increased at equal increments for each minute of testing.

Back Pressure - pressure in excess of atmospheric applied to the pore water of a soil sample. Back pressure is usually applied to 1) increase saturation of the sample, or 2) simulate the actual in-situ pressure regime.

K. Unconfined Compression - Test procedures were as described in ASTM D 2166-66. Unconfined compressive strength is defined as the load per unit area at which an unconfined prismatic or cylindrical specimen of soil will fail in a simple compression test. In these methods, unconfined compressive strength is taken as the maximum load attained per unit area or the load per unit area at 20 percent axial strain, whichever occurred first during the performance of a test.

L. Direct Shear - The procedures of ASTM D 3080-72 were followed for direct shear testing. In this test, soil under an

applied normal load is stressed to failure by moving one section of the soil container (shear box) relative to the other section. Normal stress is the value of load per unit area acting perpendicular to the plane of shearing. Maximum shear strength is defined as the maximum resistance of a soil to shearing (tangential) stresses.

M. Consolidation (ASTM D 2435-70) - A consolidation test is a test in which a cylindrical soil specimen is laterally confined in a ring and compressed between porous plates. The term "consolidation", as used here, indicates the gradual reduction in volume of the soil mass resulting from an increase in compressive stress (axial load per unit area).

N. Chemical - The chemical tests performed on soil samples included: pH; water soluble sodium, chloride, sulphate, calcium; and calcium carbonate content. The pH is an index of the acidity or alkalinity of a soil in terms of the logarithm of the reciprocal of the hydrogen ion concentration. ASTM test procedure designations for these chemical tests are included in the list on the first page of this Explanation.

O. CBR - California Bearing Ratio (CBR) is the ratio (in percent) of the resistance to penetration developed by a subgrade soil to that developed by a standard crushed-rock base material. The procedures for conducting a CBR test were as outlined in ASTM D 1883-73. The materials tested

for CBR were also analyzed for particle-size distribution (ASTM D 422-63) and compaction characteristics (ASTM D 1557-70). The term "percentage of maximum density" indicates the ratio (as a percentage) of the compacted sample dry unit weight to maximum dry density obtained in the laboratory from ASTM D 1557-70, "Moisture-Density Relations of Soils Using 10-pound (4.5-kg) Hammer and 18-inch (457-mm) Drop."

D-2	3.3 - 3.7	1.00 - 1.13			
P-3	6.3 - 6.8	1.92 - 2.07			
P-3	7.0 - 7.5	2.13 - 2.29			
P-3	7.6 - 8.1	2.32 - 2.47			
P-3	7.6 - 8.1	2.32 - 2.47	0	7	93
P-4	10.8 - 11.6	3.29 - 3.54			
P-5	16.5 - 17.4	5.03 - 5.30			
P-5	17.4 - 18.0	5.30 - 5.49			
P-6	20.8 - 21.6	6.34 - 6.58			
P-7	25.8 - 26.6	7.86 - 8.11	0	76	24
P-8	30.8 - 31.6	9.39 - 9.63	19	77	4
P-9	40.8 - 41.6	12.44 - 12.68	26	70	4
P-10	50.8 - 51.6	15.48 - 15.73			
P-11	60.8 - 61.6	18.53 - 18.78			
P-12	70.8 - 71.6	21.58 - 21.82	31	65	4
D-13	80.8 - 81.3	24.63 - 24.78			
D-14	90.5 - 91.0	27.58 - 27.74	20	68	12
D-15	94.0 - 94.6	28.65 - 28.83			
D-1	2.3 - 2.9	0.70 - 0.88	0	63	37
D-2	5.3 - 5.9	1.62 - 1.80			
D-3	7.3 - 7.9	2.23 - 2.41	11	85	4
P-4	15.1 - 16.7	4.60 - 5.09	0	3	97
P-5	20.1 - 20.9	6.13 - 6.37			
P-5	20.9 - 22.6	6.37 - 6.89	1	25	74
P-6	25.9 - 26.7	7.89 - 8.14	27	69	4
P-7	30.9 - 31.7	9.42 - 9.66	0	4	96
P-7	30.2 - 30.7	9.20 - 9.36			
P-7	31.0 - 31.5	9.45 - 9.60			
P-7	31.8 - 32.3	9.69 - 9.85			
P-8	40.9 - 41.7	12.47 - 12.71	5	15	80
D-9	50.0 - 50.8	15.24 - 15.48			
P-10	60.9 - 61.7	18.56 - 18.81	0	51	49
D-11	70.0 - 70.8	21.34 - 21.58	47	34	19

		CH	75.7	1213	36.1
		CH	69.4	1112	44.8
		SM	90.7	1453	22.7
	NP	SM	95.1	1524	14.4
		SP	104.9	1680	15.8
		SW	112.6	1804	11.1
		SM	96.8	1551	16.4
		SM	92.7	1485	21.5
		SP	112.5	1802	13.9
		SP	113.7	1821	7.4
		SP-SM	107.8	1727	13.3
		SP-SM	109.9	1761	9.9
		SM	86.5	1386	7.0
		SP	105.3	1687	2.6
		SP	116.9	1873	15.3
	NP	ML	71.7	1149	28.7
		CL-ML	100.9	1616	10.9
19	6	CL-ML	98.0	1570	10.7
		SP	109.9	1761	6.9
27	1	ML	77.0	1234	27.2
		ML	77.4	1240	26.6
		ML	78.0	1250	25.2
		ML	89.6	1435	20.0
18	8	CL	99.6	1596	17.6
		CL	93.1	1491	15.2
		SM	77.8	1246	20.5
		GM	116.5	1866	4.9

48.7	1.39										
86.5	1.24					*					
93.3	1.16					*					
125.0	1.10										
107.8	0.87				2.68						
91.5	1.29									*	
79.4	1.23								*		
84.8	1.43						*				
71.4	0.86										
50.6	0.77										
70.6	0.61										
60.6	0.50										
59.7	0.74										
71.1	0.82										
75.5	0.50										
41.5	0.48										
63.9	0.56										
50.2	0.53										
20.1	0.95										
11.7	0.60										
93.7	0.44										
57.5	1.35										
44.3	0.67						*				
40.1	0.72										
35.2	0.53										
61.7	1.19										
61.0	1.18					*					
58.5	1.16					*					
61.7	0.88					*					
68.9	0.69										
50.8	0.81							*			
47.5	1.17										
29.3	0.45										
65.7	0.49										

	D-7	20.3 - 20.8	6.19 - 6.34	52	39	9	
	D-8	25.5 - 26.0	7.77 - 7.92	35	41	24	
	D-9	30.5 - 31.0	9.30 - 9.45	46	46	8	
	D-11	50.2 - 50.7	15.30 - 15.45	53	37	10	
	D-12	60.2 - 60.7	18.35 - 18.50				
	D-13	70.3 - 70.6	21.43 - 21.52	26	49	25	
	D-13	70.6 - 70.8	21.52 - 21.58	47	44	9	
	D-14	80.3 - 80.8	24.48 - 24.63				
CV-B-4	D-2	3.0 - 3.5	0.91 - 1.07				
	P-3	5.0 - 5.8	1.52 - 1 77				
	P-3	5.8 - 6.6	1.77 - 2.01	0	75	25	
	P-3	5.8 - 6.6	1.77 - 2.01				
	P-3	6.6 7.1	2.01 - 2.16				
	P-4	8.0 - 9.0	2.44 - 2.74	0	82	18	
	D-7	30.3 - 30.8	9.24 - 9.39	58	30	12	
	D-8	40.3 - 40.8	12.28 - 12.44				
	D-9	50.3 - 50.8	13.33 - 15.48	24	57	19	
	D-11	70.3 - 70.8	21.43 - 21.58	45	46	9	
	D-12	80.3 - 80.8	24.48 - 24.63				
	D-14	*99.3 - 99.8*	*30.27 - 30.42*	42	46	12	
CV-T-1	B-1	0.5 - 2.0	0.15 - 0.61	3	68	29	
	b-2	11.0 - 12.0	3.35 - 3.66	56	40	4	100
CV-T-2	B-1	0.5 - 1.5	0.15 - 0.46	49	33	18	
CV-T-3	b-3	10.0 - 11.0	3.05 - 3.35				
CV-T-4	B-1	0.5 - 2.0	0.15 - 0.61	1	58	41	
CV-T-5	B-1	0.5 - 2.0	0.15 - 0.61	0	22	78	
	b-3	10.0 - 11.0	3.05 - 3.35	0	60	40	
CV-T-6	b-2	10.0 - 11.0	3.05 - 3.35	11	52	37	
CV-P-1	B-1	0.5 - 2.0	0.15 - 0.61	43	43	14	
CV-P-3	b-1	0.5 - 1.5	0.15 - 0.46	54	28	18	
CV-P-5	b-1	0.5 - 2.0	0.15 - 0.61	0	34	66	

BY WEIGHT					ATTERBERG LIMITS (b)			USCS (c)	IN SITU					COMPACTED			SPECIFIC GRAVITY OF SOLIDS	TRIAXIAL (i)	UNCONFINED COMPRESSION
DARD SIEVE NO.			PARTICLE SIZE (mm)						DRY UNIT WEIGHT		CONTENT MOISTURE (%)	SATURATION (%)	VOID RATIO	MAXIMUM DRY DENSITY		OPTIMUM MOISTURE			
ND		SILT OR CLAY																	
40	100	200	.005	.001	LL	PL	PI		(pcf)	(kg/m3)				(pcf)	(kg/m3)				
80	64	54			31	29	2	ML	95.2	1525	18.4	67.6	0.71				2.61		
17	11	9						GP-GM	112.2	1797	14.3	77.0	0.50						
35	26	24			32	21	11	SC	113.9	1825	10.7	60.6	0.48						
18	10	8						GW-GM	123.9	1985	9.4	70.5	0.36						
20	12	10						GW-GM	127.2	2038	10.2	84.4	0.33						
								GW-GM	126.1	2020	10.5	84.7	0.34						
45	32	25						SM	116.6	1868	12.7	77.0	0.45						
21	12	9						GW-GM	128.5	2059	7.0	61.2	0.31						
								SM	112.5	1802	14.9	81.2	0.50						
								SM	114.3	1831	6.2	35.0	0.47						*
								SM	99.0	1586	11.0	42.5	0.70					*	
92	41	25					NP	SM	93.4	1496	10.6	35.6	0.80						
								SM	99.1	1588	11.7	45.1	0.70					*	
								SM	94.5	1514	11.7	40.4	0.78					*	
94	34	18						SM	100.6	1612	6.8	28.4	0.63				2.63		
18	14	12			42	18	24	GP-GC	122.5	1962	9.5	68.6	0.38						
								GP-GC	119.4	1913	12.6	83.2	0.41						
44	22	19			34	16	18	SC	123.8	1983	12.9	96.8	0.36						
23	12	9			42	21	21	SW-SC	123.2	1974	8.6	62.8	0.37						
							NP	SM	128.7	2062	7.9	68.8	0.31						
25	15	12						SP-SM	119.2	1910	10.7	70.1	0.41						
90	42	29					NP	SM						128.6	2060	9.0	2.68		
29	8	4						GP											
28	23	18						GM											
					41	20	21	CL											
92	66	41						SM						112.5	1802	14.0			
95	85	78	20	5	35	23	12	CL						106.0	1698	20.0	2.64		
98	67	40					NP	SM											
64	48	37						SM											
41	21	14						GM											
33	25	18						GM											
97	81	66					NP	ML											
					29	18	11	CL											

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USCS (c)	IN SITU					COMPACTED			SPECIFIC GRAVITY OF SOLIDS	TRIAXIAL (f)	UNCONFINED COMPRESSION	DIRECT SHEAR	CONSOLIDATION	CHEMICAL	CBR
	DRY UNIT WEIGHT		CONTENT MOISTURE (%)	SATURATION (%)	VOID RATIO	MAXIMUM DRY DENSITY		OPTIMUM MOISTURE							
	(pcf)	(kg/m3)				(pcf)	(kg/m3)								
ML	95.2	1525	18.4	67.6	0.71				2.61						
GP-GM	112.2	1797	14.3	77.0	0.50										
SC	113.9	1825	10.7	60.6	0.48										
GW-GM	123.9	1985	9.4	70.5	0.36									*	
GW-GM	127.2	2038	10.2	84.4	0.33										
GW-GM	126.1	2020	10.5	84.7	0.34										
SM	116.6	1868	12.7	77.0	0.45										
GW-GM	128.5	2059	7.0	61.2	0.31										
SM	112.5	1802	14.9	81.2	0.50									*	
SM	114.3	1831	6.2	35.0	0.47						*				
SM	99.0	1586	11.0	42.5	0.70					*					
SM	93.4	1496	10.6	35.6	0.80										
SM	99.1	1588	11.7	45.1	0.70					*					
SM	94.5	1514	11.7	40.4	0.78					*					
SM	100.6	1612	6.8	28.4	0.63				2.63			*			
GP-GC	122.5	1962	9.5	68.6	0.38										
GP-GC	119.4	1913	12.6	83.2	0.41										
SC	123.8	1983	12.9	96.8	0.36										
SW-SC	123.2	1974	8.6	62.8	0.37									*	
SM	128.7	2062	7.9	68.8	0.31										
SP-SM	119.2	1910	10.7	70.1	0.41										
SM						128.6	2060	9.0	2.68						*
GP															
GM															
CL															
SM						112.5	1802	14.0							*
CL						106.0	1698	20.0	2.64						*
SM															
SM															
GM															
GM															
ML														*	
CL															

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SUMMARY OF LABORATORY TEST RESULTS
CAVE VALLEY, NEVADA
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TABLE D-10.1

ACTIVITY NUMBER	SAMPLE NUMBER (a)	SAMPLE INTERVAL		SIEVE ANALYSIS			PERCENT FINER BY WEIGHT							
							STANDARD SIEVE OPENING				U S STANDARD SIEV			
							GRAVEL				SAND			
		FEET	METERS	GR	SA	FI	3"	1 1/2"	3/4"	3/8"	4	10	40	1
CV-P-6	b-2	3.0 - 4.0	0.91 - 1.22	83	13	4	100	70	26	19	17	15	11	
CV-P-7	b-1	0.5 - 2.0	0.15 - 0.61	59	19	22		100	80	47	41	38	32	2
CV-P-8	B-1	0.5 - 2.0	0.15 - 0.61	0	3	97								1
CV-P-9	B-1	0.5 - 1.5	0.15 - 0.46	11	56	33			100	95	89	84	66	
CV-CS-14	B-1	0.5 - 2.0	0.15 - 0.61	48	45	7		100	89	68	52	40	18	

NOTES:

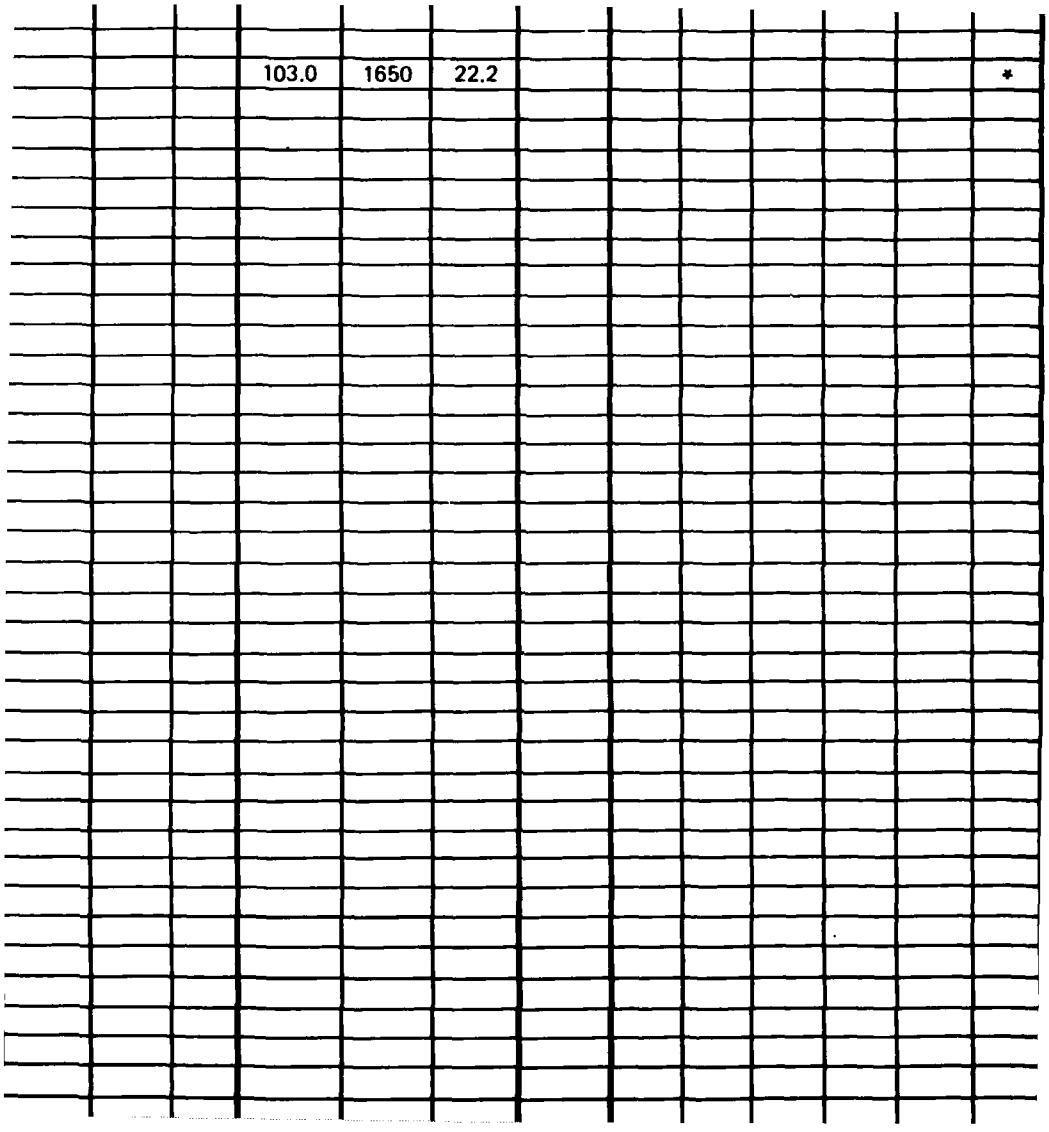
(a) Sample types
- SS - Standard split spoon
- P - Pitcher
- D - Ertec Drive
- B, b - Bulk

(b) NP - Not Plastic

(c) USCS - Unified Soil Classification System

(d) * Indicates that test has been performed and results are included in this report

T FINER BY WEIGHT						ATTERBERG LIMITS (b)			USCS (c)	IN SITU					COMPACTED			SPECIFIC GRAVITY OF SOLIDS	TRIAXIAL (d)
U S STANDARD SIEVE NO					PARTICLE SIZE (mm)					DRY UNIT WEIGHT		MOISTURE CONTENT (%)	SATURATION (%)	VOID RATIO	MAXIMUM DRY DENSITY		OPTIMUM MOISTURE		
SAND			SILT OR CLAY																
10	40	100	200	005	001	LL	PL	PI		(pcf)	(kg/m^3)				(pcf)	(kg/m^3)			
15	11	6	4						GP										
38	32	27	22						GM										
		100	97	72	52	60	19	41	CH						103.0	1650	22.2		
84	66	44	33					NP	SM										
40	18	9	7						GP-GM										


103.0
1650
22.2
*

BORING NO.	SAMPLE NO.	SAMPLE INTERVAL		SOIL TYPE	TYPE OF TEST	DRY DENSITY		MOISTURE CONTENT (%)	CONFINING PRESSURE (σ_3)		MAXIMUM DEVIATOR STRESS ($\sigma_1-\sigma_3$)		STRAIN RATE (%/min)	BACK PRESSURE	
		FEET	METERS			pcf	kg/m^3		ksf	kN/m^2	ksf	kN/m^2		ksf	kN/m^2
CV-B-1	P-3	6.3 - 6.8	1.92 - 2.07	CH	CD	74.5	1193	40.0	1.0	48	2.5	120	0.04	0	0
		7.0 - 7.5	2.13 - 2.29	CH	CD	77.2	1237	40.4	1.5	72	3.1	149	0.04	0	0
		7.6 - 8.1	2.32 - 2.47	CH	CD	79.6	1275	51.3	2.0	96	5.0	240	0.04	0	0
CV-B-2	P-7	31.0 - 31.5	9.45 - 9.60	ML	CD	78.0	1250	25.2	3.0	144	9.1	436	0.07	0	0
		30.2 - 30.7	9.20 - 9.36	ML	CD	77.4	1240	26.6	3.5	168	11.0	527	0.05	0	0
		31.8 - 32.3	9.69 - 9.85	ML	CD	89.6	1435	20.0	4.0	192	11.6	555	0.05	0	0
CV-B-4	P-3	5.0 - 5.8	1.52 - 1.77	SM	CD	99.0	1586	11.0	0.5	24	2.5	120	0.04	0	0
		5.8 - 6.6	1.77 - 2.01	SM	CD	99.1	1588	11.7	1.0	48	5.1	244	0.04	0	0
		6.6 - 7.1	2.01 - 2.16	SM	CD	94.5	1514	11.7	1.5	72	6.0	287	0.05	0	0

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SUMMARY OF TRIAXIAL COMPRESSION TEST RESULTS
CAVE VALLEY, NEVADA

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TABLE II-10-2

BORING NO.	SAMPLE NO.	SAMPLE INTERVAL FEET	SAMPLE INTERVAL METERS	SOIL TYPE	UNCONFINED COMP. STRENGTH ksf	UNCONFINED COMP. STRENGTH kN/m²	DRY DENSITY pcf	DRY DENSITY kg/m³	MOISTURE CONTENT (%)	DEGREE OF SATURATION (%)	HEIGHT/ DIAMETER
CV-B-1	P-5	17.4 - 18.0	5.30 - 5.49	CH	1.6	74	69.4	1112	44.8	84.8	2.09
CV-B-2	P-5	20.1 - 20.9	6.13 - 6.37	CL-ML	3.8	184	100.9	1616	10.9	44.3	2.09
CV-B-4	D-2	3.0 - 3.5	0.91 - 1.07	SM	2.3	112	114.3	1831	6.2	35.0	2.40

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SUMMARY OF UNCONFINED COMPRESSION TEST RESULTS CAVE VALLEY, NEVADA

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TABLE II-10-3

BORING NO.	SAMPLE NO.	SAMPLE INTERVAL		SOIL TYPE	NORMAL STRESS		MAXIMUM SHEAR STRENGTH	
		FEET	METERS		ksf	kN/m^2	ksf	kN/m^2
CV-B-2	D-9	50.0 - 50.8	15.24 - 15.48	CL	5.0	239	4.12	197
					7.5	359	6.13	294
					10.0	479	7.34	351
CV-B-4	P-4	8.0 - 8.7	2.44 - 2.65	SM	0.8	38	0.66	32
					1.6	77	1.43	68
					2.4	115	1.70	81

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SUMMARY OF DIRECT SHEAR TEST RESULTS
CAVE VALLEY, NEVADA

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TABLE II-10-4

ACTIVITY NO.	SAMPLE NO.	SAMPLE INTERVAL		SOIL TYPE	pH	WATER SOLUBLE				CALCIUM CARBONATE
		FEET	METERS			SODIUM	CHLORIDE	SULPHATE	CALCIUM	
						mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
CV-B-1	P-4	10.8 - 11.6	3.29 - 3.54	CH	9.5	1200	449	950	82	386
CV-B-3	D-9	30.5 - 31.0	9.30 - 9.45	GW-GM	8.3	40	55	50	30	125
	D-14	80.3 - 80.8	24.48 - 24.63	SM	8.6	26	82	40	51	204
CV-B-4	D-11	70.3 - 70.8	21.43 - 21.58	SW-SC	8.3	25	75	71	45	175
CV-P-5	b-1	0.5 - 2.0	0.15 - 0.61	ML	7.6	11	37	18	70	294

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SUMMARY OF CHEMICAL TEST RESULTS
CAVE VALLEY, NEVADA

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TABLE II-10-5

COMPOSITE SAMPLE NUMBER	SOIL TYPE	PERCENT PASSING #200	ATTERBERG LIMITS		SPECIFIC GRAVITY	MAXIMUM DRY DENSITY		OPTIMUM MOISTURE (%)	COMPACTED DRY DENSITY		COMPACTED MOISTURE (%)	PERCENT OF MAXIMUM DRY DENSITY	CBR (%)
			LL	PI		pcf	kg/m^3		pcf	kg/m^3			
A	SM	29		NP	2.68	128.6	2060	9.0	121.5	1946	9.0	94.5	36
									116.2	1832	8.5	90.4	18
B	SM	41				112.5	1802	14.0	107.8	1727	15.2	95.8	33
									104.4	1672	14.5	92.8	27
									100.7	1613	14.8	89.6	17
C	CL	78	35	12	2.64	106.0	1698	20.0	100.9	1616	20.5	95.2	17
									97.6	1564	21.4	92.0	11
									92.4	1480	20.8	87.2	8
D	CH	97	60	41		103.0	1650	22.2	101.5	1626	21.4	98.5	8
									98.3	1575	21.4	95.5	3
									88.9	1424	21.1	86.3	2

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CALIFORNIA BEARING RATIO (CBR) TEST RESULTS CAVE VALLEY, NEVADA

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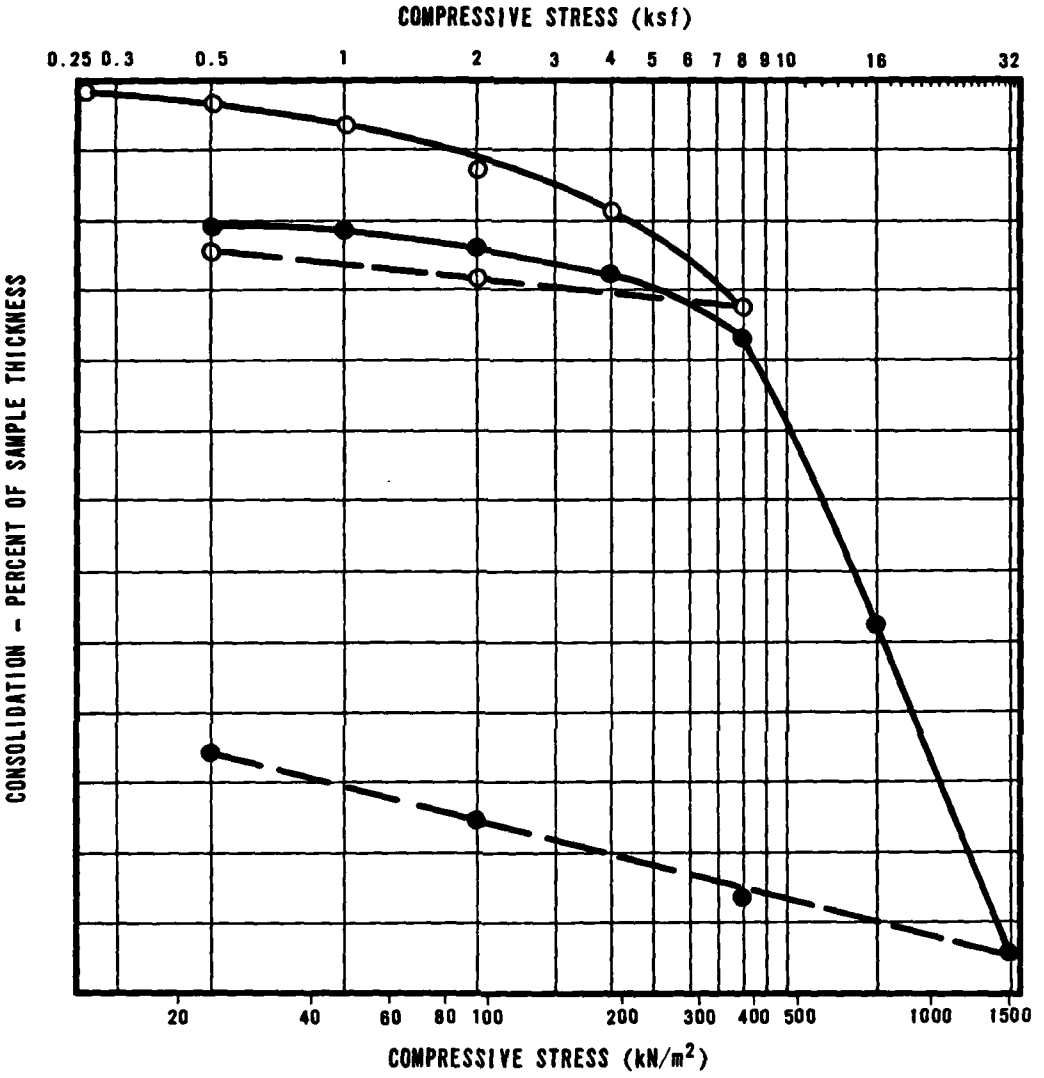
TABLE II-10-6



SYMBOL	BORING NO.	SAMPLE NO.	SAMPLE INTERVAL		SOIL TYPE	INITIAL DRY DENSITY		INITIAL MOISTURE CONTENT (%)	INITIAL VOID RATIO	INITIAL DEGREE OF SATURATION (%)
			FEET	METERS		pcf	kg/m³			
O	CV-B-1	P-5	16.5 - 17.4	5.03 - 5.30	CH	75.7	1213	36.1	1.23	79.4

O AT FIELD MOISTURE

● AFTER ADDITION OF WATER

——— COMPRESSION

– – – REBOUND

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CONSOLIDATION TEST RESULTS
CAVE VALLEY, NEVADA

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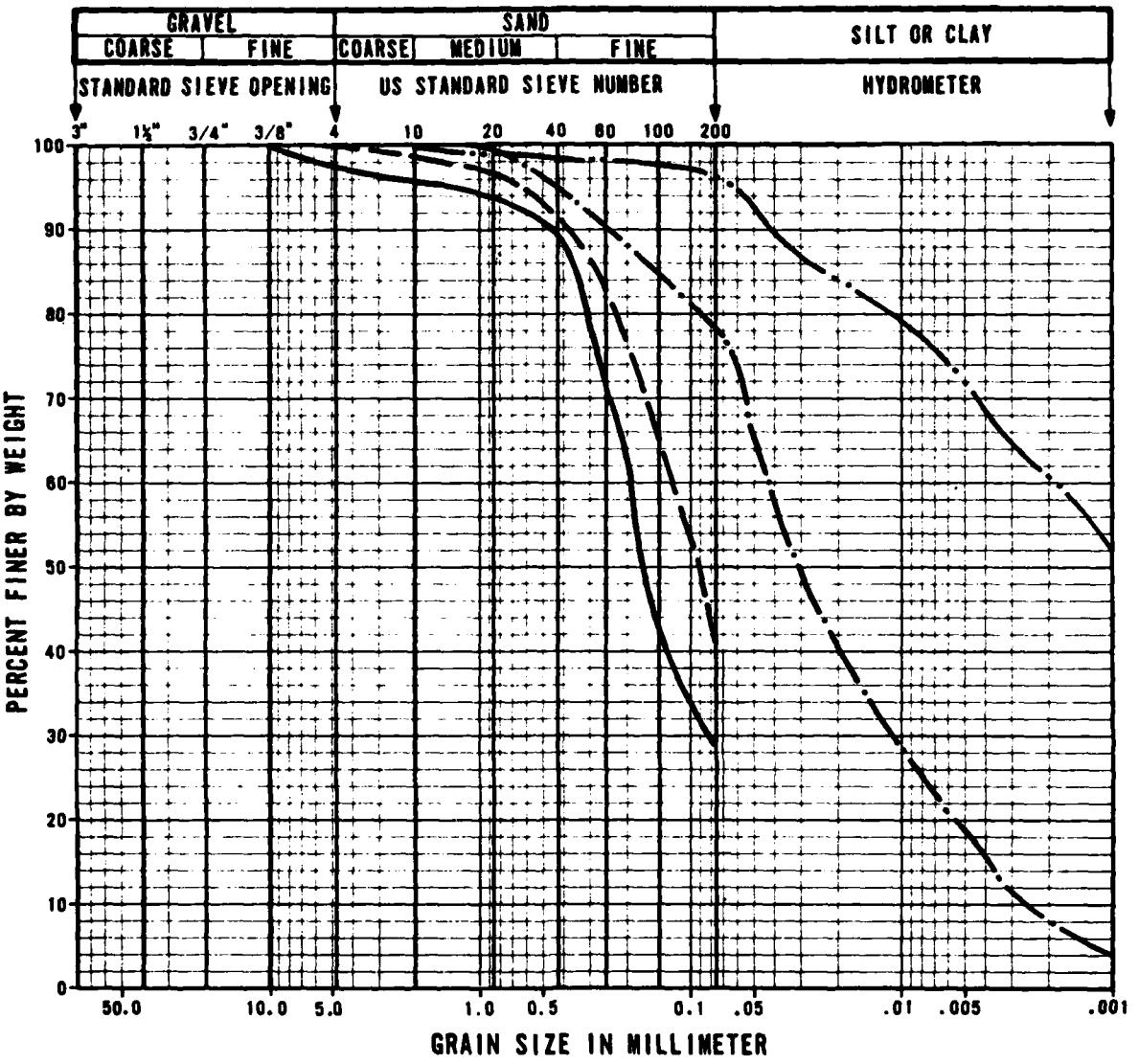
FIGURE II-10-1



SYMBOL	COMPOSITE SAMPLE NUMBER	ACTIVITY NUMBER	SAMPLE INTERVAL		SOIL TYPE
			FEET	METERS	
———	A	CV-T-1	0.5 - 2.0	0.15 - 0.61	SM
— —	B	CV-T-4	0.5 - 2.0	0.15 - 0.61	SM
—·—	C	CV-T-5	0.5 - 2.0	0.15 - 0.61	CL
—··—	D	CV-P-8	0.5 - 2.0	0.15 - 0.61	CH

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GRAIN SIZE CURVES, CBR TESTS
CAVE VALLEY, NEVADA

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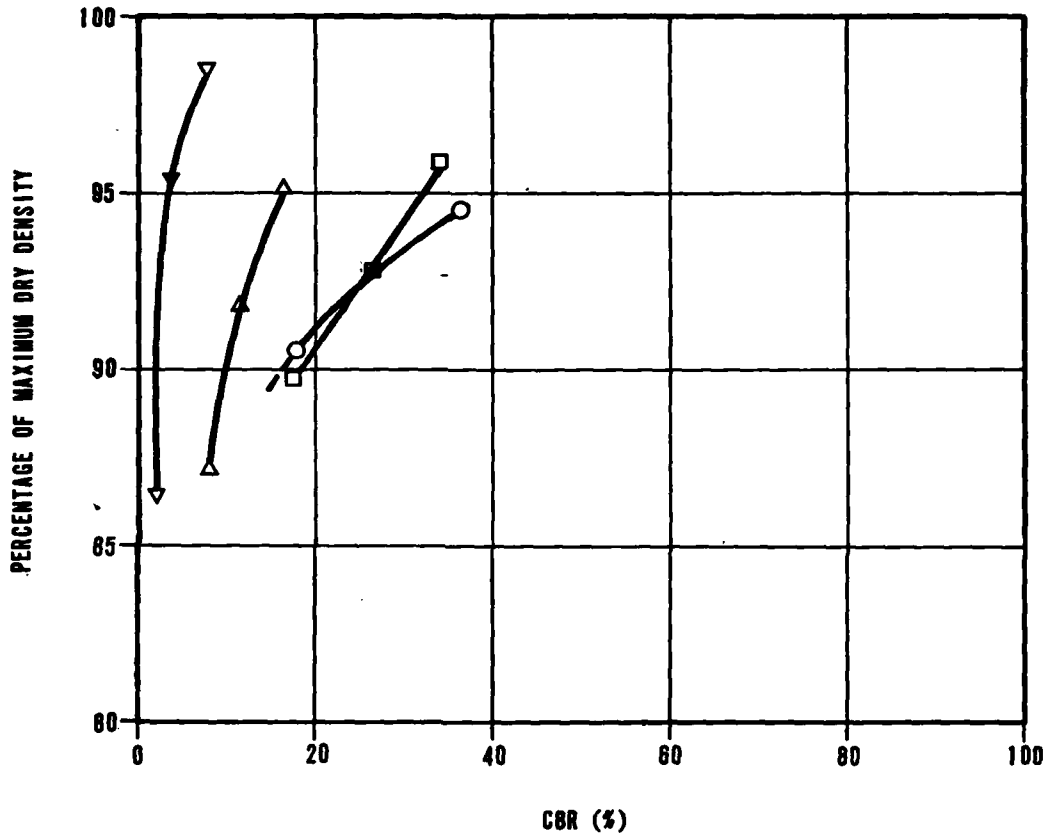
FIGURE II-10-2



SYMBOL	COMPOSITE SAMPLE NUMBER	SOIL TYPE
○	A	SM
□	B	SM
△	C	CL
▽	D	CH

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CALIFORNIA BEARING RATIO (CBR) CURVES CAVE VALLEY, NEVADA

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FIGURE II-10-3


DATE
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